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ARMY MEDICAL DEPARTMENT

REPORTS.

FOR THE YEAR 1872.

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VOLUME XIV.

Presented to both Houses of Parliament by Command of Her Majesty.

LONDON:
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE,
BY HARRISON AND SONS,
Printers in Ordinary to Her Majesty.

1874.

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355.34500941
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1102 ii+

TO THE RIGHT HONOURABLE

THE SECRETARY OF STATE FOR WAR.

SIR,

IN accordance with instructions laid down for the conduct of business by the Director-General and Heads of Branches of the Army Medical Department, I have the honour to submit the accompanying Report on the Health of the Army in 1872, and on various matters connected with the duties of the Officers of the Department.

The Statistical, Sanitary, and Medical Reports have been drawn up by the Officers in charge of the respective Branches.

I have the honour to be,
SIR,
Your most obedient
Humble Servant,
W. M. MUIR,
Director-General.

ARMY MEDICAL DEPARTMENT,
August 1874.

CONTENTS.

	PAGE
Letter from the Director-General to the Secretary of State for War	iii
REPORT.	
I. On the Health of the Troops serving in the UNITED KINGDOM—	
1. Sickness and Mortality	1
Admissions and Deaths by Classes of Diseases	2
" " at the different Groups of Stations ..	3
Remarks on the Prevalence of the principal Diseases at these ..	6
Prevalence of Primary Venereal Sores at each of the large Stations.	8
Tables showing the working of the Contagious Diseases Act for eight years	9
Admissions, Deaths, and Invaliding from the different Arms of the Service	13
Deaths among the Soldiers and among the Pensioners placed upon the Pension List in 1872	14
Admissions, Deaths, and Invaliding by Classes of Diseases in the different Arms	15
Remarks upon ditto	17
Deaths and Invaliding by Phthisis, &c., in the different Arms ..	20
Relative prevalence of the more important diseases of the Circulatory System	21
Prevalence of Suicide in each arm of the Service	23
Admissions, Deaths, and Invaliding in each Corps	24
Re-Vaccination of Soldiers and Recruits	32
Aldershot Camp: Sanitary State of	34
Eastern District, ditto	34
South-Eastern District, ditto	36
Chatham District, ditto	36
Southern District, ditto	37
Woolwich Garrison, ditto	37
Netley, ditto	38
Western District, ditto	38
Northern District, ditto	41
North Britain, ditto	42
Ireland, ditto	45
Dublin District ditto	45
Curragh Camp, ditto	45
South-Western District, ditto	46
2. On the Extent of Invaliding	47
3. On the Number constantly Sick in Hospital	47
4. On the Influence of Age on the Mortality	48
5. On the Recruiting of the Army	48
Number of Recruits Inspected and Rejected	49
Proportion of Rejections in each of the Recruiting Districts ..	49
Native Countries of the Recruits inspected	50
Number inspected for each Arm of the Service	50
Causes of Rejection of Recruits found unfit	51
Ages of the Recruits	53
Height of the Recruits	54
Weight of the Recruits inspected at Head-Quarters of Districts	54
Extent of Education of Recruits inspected at Head-Quarters of Districts, and at Regiments and Depôts	55
Previous Occupations of Recruits	55

PAGE

II. On the Health of the Troops serving in the MEDITERRANEAN—
1. Sickness and Mortality 56
I. Gibraltar: Sickness and Mortality at 56
Admissions and Deaths by Classes of Diseases 57
Remarks on ditto 58
Sanitary state of the Command 59
II. Malta: Sickness and Mortality at 61
Admissions and Deaths by Classes of Diseases 62
Remarks on ditto 63
Prevalence of Continued Fevers 63
Royal Malta Fencible Artillery, Admissions and Deaths among, by Classes of Diseases 67
Sanitary state of the Command 69
2. On the Extent of Invaliding among Troops serving in the Mediterranean 70
3. Mean Daily Sick of ditto 71
4. On the Influence of Age on the Mortality 71

III. On the Health of Troops serving in the DOMINION OF CANADA—
1. Sickness and Mortality in the Dominion of Canada.. 72
Admissions and Deaths by Classes of Diseases 73
Remarks on ditto 73
Sanitary state of the Command 74
2. On the Extent of Invaliding 75
3. Mean Daily Sick 75
4. Influence of Age on the Mortality 76

IV. On the Health of the Troops serving in BERMUDA—
1. Sickness and Mortality in Bermuda 76
Admissions and Deaths by Classes of Diseases 77
Remarks on ditto 78
Sanitary state of the Command 79
2. On the Extent of Invaliding among the Troops serving in Bermuda 79
3. Mean Daily Sick.. 80
4. Influence of Age on the Mortality 80

V. On the Health of the Troops serving in the WEST INDIES—
1. Sickness and Mortality 81
I. Sickness and Mortality of White Troops 81
Admissions and Deaths by Classes of Diseases 82
Remarks on ditto 83
Sickness and Mortality of Black Troops 84
Remarks on ditto 85
Sanitary state of the Command 87
2. On the Extent of Invaliding among Troops serving in the West Indies and Western Africa 88
3. Mean Daily Sick among Troops in West Indies 89
4. Influence of Age on the Mortality 90

VI. On the Health of the Troops serving in WESTERN AFRICA—
1. Admissions and Deaths by Classes of Diseases at Sierra Leone, and on the Gold Coast 90
Remarks on ditto 91
Sanitary State of the Command 92
3. Mean Daily Sick 93

VII. On the Health of the Troops serving at the CAPE OF GOOD HOPE AND ST. HELENA—
1. Sickness and Mortality 93
Admissions and Deaths by Classes of Diseases 94
Remarks on ditto 95
Sanitary state of the Command.. 96
2. On the Extent of Invaliding 96
3. Mean Daily Sick.. 97
4. Influence of Age on the Mortality 98

PAGE

VIII. On the Health of the Troops serving in the MAURITIUS—

1. Sickness and Mortality 98
Admissions and Deaths by Classes of Diseases 99
Remarks on ditto 100
Sanitary state of the Command 101
2. On the Extent of Invaliding 103
3. Mean Daily Sick.. 103

IX. On the Health of the Troops serving in CEYLON—

1. Sickness and Mortality of the White Troops 104
Admissions and Deaths by Classes of Diseases 105
Remarks on ditto 106
Sickness and Mortality of Asiatic Troops 107
Admissions and Deaths by Classes of Diseases 107
Remarks on ditto 108
Sanitary state of the Command 109
2. On the Extent of Invaliding 111
3. Mean Daily Sick.. 111
4. Influence of Age on the Mortality 112

X. On the Health of the Troops serving in CHINA and the STRAITS SETTLEMENTS—

1. Sickness and Mortality 112
I. China: European Troops 112
Admissions and Deaths by Classes of Diseases 113
Remarks on ditto 114
Admissions and Deaths of Asiatic Troops 115
Remarks on ditto 116
Sanitary state of the Command.. 117
II. Straits Settlements 119
1. White Troops 119
Admissions and Deaths by Classes of Diseases 120
Remarks on ditto 121
2. Asiatic Troops 122
Admissions and Deaths by Classes of Disease 123
Remarks on ditto 123
Sanitary State of the Command 123
3. On the Extent of Invaliding 127
4. Mean Daily Sick 128

XI. On the Health of the European Troops serving in INDIA—

1. Sickness and Mortality 129
I. Bengal 129
Admissions and Deaths by Classes of Diseases 130
Remarks on ditto 131
Prevalence of Cholera 131
Admissions and Deaths at each Station 134
Admissions and Deaths by Classes of Diseases in each of the Military Divisions and Districts 137
Remarks on ditto.. 141
Prevalence of Dengue 141
Prevalence of Enteric Fever 143
Sickness and Mortality in each Corps serving in the Presidency 154
Sanitary state of the Command 159
Report of Camp of Exercise 164
II. Madras 169
Admissions and Deaths by Classes of Diseases 170
Remarks on ditto 171
Admissions and Deaths at each of the principal Stations .. 173
Admissions and Deaths by Classes of Diseases in each of the Circles 174
Remarks on ditto 176

PAGE

Prevalence of Enteric Fever 177
Sickness and Mortality in each Corps serving in Madras .. 182
Sanitary state of the Command 184
III. Bombay 191
Admissions and Deaths by Classes of Diseases 191
Remarks on ditto 192
Admissions and Deaths at each of the principal Stations .. 195
Admissions and Deaths by Classes of Diseases in each of the Military Divisions 196
Remarks on ditto 199
Prevalence of Enteric Fever 199
Prevalence of Paroxysmal Fevers at the principal Stations 200
Prevalence of Syphilis at the principal Stations 203
Sickness and Mortality in each Corps serving in Bombay . . 205
Sanitary state of the Command 207
2. On the Extent of Invaliding from India 209
3. Mean Daily Sick in each of the Presidencies 210
4. Influence of Age on the Mortality 211
XII. On the Health of Troops ON BOARD SHIP 212
1. Troops proceeding on Foreign Service 213
2. „ returning from ditto 214
3. „ passing from one Station to another 215
4. Invalids returning to England 216
XIII. Summary 217

APPENDIX.

No. I. Report on Hygiène for 1873. By Dr. Parkes, F.R.S. 220
II. Chemical Examination of Water at Cape Coast Castle. By Surgeon Fleming 257
III. Analysis of Surface Soil from Cape Coast Castle. By Candidate Warden of Indian Service 264
IV. On Malarious Fevers, Cholera, &c. By Deputy Surgeon-General Munro, M.D., C.B. 266
V. On the Nature and Varieties of Destructive Lung Disease included under the term Pulmonary Consumption, as seen among Soldiers, and the Hygienic conditions under which they occur. Prize Essay by Surgeon Welch 275
VI. On the Nature and Varieties of Destructive Lung Disease included under the term Pulmonary Consumption, as seen among Soldiers, and the Hygienic conditions under which they occur. By Surgeon Alcock 399
VII. Two cases of Endocarditis. By Assistant-Surgeon W. G. Don, M.D... 417
VIII. Two cases of Penetrating Gunshot Wounds. By Surgeon-Major Tulloch, M.D. 422
IX. Case of Feigned Dumbness. By Surgeon-Major T. C. O'Leary, M.B... 430
X. Case of Sunstroke. By Surgeon-Major T. C. O'Leary, M.B. .. 431
XI. On Dengue. By Surgeon-Major G. M. Slaughter 432
XII. Case of Heart Disease. By Surgeon Longhurst 437
XIII. Army Medical School, Netley 442
XIV. Circulars, General Orders, &c. 453
1. Army Circulars :—
Clause 56. Hospital Comforts for Women and Children .. 453
„ 88. Forage Allowance 453
„ 139. Royal Warrant 453
„ 155. Duties in connection with Hospitals 453
Field Stretcher, new pattern of 454
Ambulance Wagon, new pattern of 454
Clause 9. Requisitions for Books and Forms 455

PAGE

2. General Orders :—
No. 45. Deserters 455
„ 14. Sick Reports on Soldiers 455
3. Departmental Circulars :—
No. 1. Use of Chloroform 456
„ 2. Returns of Brigade Depôts 456
„ 3. Examinations on Promotion 457

XV. Statistical Abstracts :—
1. Abstract showing the Admissions into Hospital, Deaths, and Invaliding among the Troops in the UNITED KINGDOM in 1872 .. 458
2. Abstract showing the Number of Men belonging to the Regiments serving at home who were Vaccinated during the year 1872 .. 473
3. Abstract showing the Ages of the Men serving in the different Arms at Home, and the Deaths at each Age in 1872 474
4. Abstract showing the Number of Recruits inspected, and the Number found unfit for Service in each of the Recruiting Districts during the year 1872 475
5. Abstract showing the Native Countries of the Recruits inspected at the Head-Quarters of each of the Districts during the year 1872.. 476
6. Abstract showing the Ages of the Recruits inspected in 1872 .. 476
7. Abstract showing the state of the Education of Recruits during the year 1872 476
8. Abstract showing the Heights of the Recruits inspected in 1872 .. 477
9. Abstract showing the Weights of the Recruits inspected in 1872 at the Head-Quarters of the Recruiting Districts 477
10. Abstract showing the Admissions into Hospital, and Deaths among the Troops serving in the MEDITERRANEAN; and the Disabilities of the Men sent to England as Invalids, and of those finally Discharged the Service 478
11. Abstract showing the Ages of the Troops in the Mediterranean, and the Deaths at each Age 483
12. Abstract showing the Admissions into Hospital, and Deaths among the Troops serving in the DOMINION OF CANADA and in BERMUDA, and the Disabilities of the Invalids sent to England from these Colonies, and of those finally discharged the Service 484
13. Abstract showing the Ages of the Troops serving in the Dominion of Canada and in Bermuda, and the Deaths at each Age 488
14. Abstract showing the Admissions into Hospital, and Deaths among the White Troops serving in the WINDWARD and LEEWARD COMMAND and JAMAICA; and the disabilities of the Invalids sent home, and of those discharged the Service at Netley 489
15. Abstract showing the Admissions into Hospital, and Deaths among the Black Troops serving in the WINDWARD and LEEWARD COMMAND, JAMAICA, HONDURAS, the BAHAMAS, and WESTERN AFRICA; and the Disabilities of those discharged the Service as Invalids in the West Indies and Western Africa 492
16. Abstract showing the Admissions into Hospital, and Deaths among the Troops serving at the CAPE OF GOOD HOPE and ST. HELENA, MAURITIUS, and CEYLON 496
17. Abstract showing the Diseases of the Men sent Home as Invalids from the Cape of Good Hope and St. Helena, Mauritius, and Ceylon, and of Invalids finally discharged the Service in these Colonies, and at Netley 500
18. Abstract showing the Admissions into Hospital, and Deaths among the Troops serving in CHINA and the STRAITS SETTLEMENTS, during the year 1872, and the Number of Men sent Home as Invalids, and of those discharged the Service at Netley .. 502
19. Abstract showing the Admissions into Hospital, and Deaths among Her Majesty's European Troops serving in BENGAL, MADRAS, and BOMBAY; the disabilities of the Invalids sent Home from each of the Presidencies, and of the Invalids from India finally discharged the Service at Netley, during the year 1872 506

PAGE

20. Abstract showing the Ages of the Troops serving in the Bengal, Madras, and Bombay Commands respectively, and the Deaths at each Age, during the year 1872 516

21. Abstract showing the Cases of Sickness and the Deaths among the Troops ON BOARD SHIP proceeding on, and returning from Foreign Service, and passing from one Colony or Station to another 520

XVI. Abstracts showing the Monthly Results of Meteorological Observations taken in the year 1872 at Home Stations 524

XVII. Ditto ditto at Foreign Stations.. 544

ARMY MEDICAL DEPARTMENT, REPORT FOR 1872.

I.—ON THE HEALTH OF THE TROOPS SERVING IN THE UNITED KINGDOM IN 1872.

Section I.

Sickness and Mortality.

STATISTICAL REPORT.

United Kingdom.

THE average strength of the troops serving in the United Kingdom during the 52 weeks ending 27th December 1872, calculated from the Weekly Returns furnished to the Army Medical Department, was 92,218: their admissions into hospital were 72,326; the deaths among the men amounted to 714; and the average number constantly sick was 3,628. The ratios per 1,000 of the strength represented by these numbers are,—for admissions 784·3, for deaths 7·74, and for constantly sick 39·34. In addition, however, to those included in the Weekly Returns, 76 deaths occurred during the year among men detached from their regiments, and it appears from the Adjutant-General's Returns, that the average number so detached was 7,089. The average strength of the whole force in the United Kingdom was, therefore, 99,307, and the total number of deaths in it 790, which give a ratio of 7·95 per 1,000 of the strength.

The ratios of admissions and deaths are lower than those for the previous year by 31·9, and ·67 respectively. In that of constantly sick there is an increase of ·56.

The following Table shows the ratios of sickness and mortality per 1,000 of the strength in 1872, compared with the average of the previous ten years:—

	Ratio per 1,000 of Mean Strength.		
	Admitted into Hospital.	Died.	Constantly Sick.
1872..	784·3	7·95	39·34
1862–71	888·6	9·36	44·14

All the ratios for 1872 are considerably below the average.

The following Table shows the admissions and deaths from each class and order of diseases in 1872, and their ratios per 1,000 of the mean strength, compared with the results for the average of the previous three years.

United Kingdom.

Orders.	Average Strength in Weekly Returns, 92,218.* Average Strength, including men detached, 99,307.*	Admitted into Hospital	Died. With the Regiment.	Died. Absent from the Regiment.	Died. Total.	Ratio per 1,000 of Mean Strength— 1872. Admitted.	1872. Died.	1869–71. Admitted.	1869–71. Died.
	I. *General Diseases.*								
1	Febrile Group ..	4,502	63	4	67	48·8	·67	55·8	·67
2	Constitutional „ ..	14,044	222	31	253	152·3	2·55	157·5	3·08
	II. *Local Diseases.* Diseases of the—								
1	Nervous System ..	1,007	44	7	51	10·9	·52	11·0	·59
2	Eye	1,467	..	..	..	15·9	..	15·2	..
3	Ear	308	..	..	..	3·3	..	3·5	..
4	Nose	34	..	..	..	·4	..	·3	..
5	Circulatory System ..	1,362	120	9	129	14·8	1·30	11·3	1·57
6	Absorbent „ ..	1,123	..	..	..	12·2	..	13·0	·01
7	Ductless Glands ..	3	..	..	..	·1	..	·1	
8	Respiratory System ..	7,058	104	5	109	76·5	1·10	82·0	1·25
9	Digestive „ ..	8,949	47	8	55	97·0	·55	97·5	·55
10	Urinary „ ..	10,520	22	3	25	114·1	·25	118·3	·29
11	Generative „ ..	1,093	..	..	..	11·8	..	12·8	
12	Organs of Locomotion	487	4	..	4	5·3	·04	4·9	·08
13	Cellular Tissue ..	1,968	3	1	4	21·3	·04	21·4	
14	Cutaneous System ..	8,767	..	..	..	95·1	..	98·6	..
	III. *Conditions, &c.*								
	Debility	508	1	..	1	5·5	·01	2·8	·01
	IV. *Poisons* ..	202	11	..	11	2·2	·11	2·6	·11
	V. *Injuries.*								
2	Accidental Injuries ..	8,767	49	7	56	95·1	·56	96·9	·54
3	Homicidal „ ..	2	3	..	3	·3	·03	·3	·02
4	Self-inflicted „ ..	23	19	..	19		·19		·33
6	Judicial „ ..	..	..	1	1	..	·01		
	VI. *Surgical Operations*	36	1	..	1	·4	·01	·2	·02
	Not known	..	1	..	1	..	·01	..	
	No Appreciable Disease	96	..	..	..	1·0	..	1·1	
	Total	72,326	714	76	790	784·3	7·95	808·1	9·12

* For obvious reasons the ratio of admissions into hospital has been calculated upon the first, and that of deaths upon the second, of these numbers.

General Diseases were below the average as to prevalence, and also slightly less fatal, the reduction in prevalence being greatest in the febrile group, and that in mortality confined to the constitutional one. The admissions from the latter group, though below the average of the three years, exceeded those in 1871.

Diseases of the Circulatory System were rather above the average, and those of the *Respiratory System* below it. With these exceptions, there was little change in the prevalence of the various orders of local diseases.

In the tables which follow, the sickness and mortality at the different groups of stations are shown in the usual form, the classification of the stations being the same as that adopted in the Report for 1871, with the exception that a group has been added for men employed in the Autumn Manœuvres. On account of the exceptional circumstances under which they were placed, these men could not with propriety be included in any of the other groups, and the illustration which their statistics afford of the immediate effects on health of employment on such a service in the United Kingdom is believed to be of sufficient interest to justify their being shown separately.

United Kingdom.

	Average Strength.	Admitted into Hospital.	Died.	Average constantly Sick.
1. Seaport Towns	15,628	12,123	178	598
2. Dockyards and Arsenals	12,568	11,141	86	565
3. Camps	22,670	16,837	169	823
4. Large Manufacturing Towns ..	4,552	3,934	32	211
5. London and Windsor	5,478	4,568	35	280
6. Dublin	4,914	4,232	47	255
7. Remaining Stations	24,530	18,832	157	869
8. Autumn Manœuvres	1,878	659	10	27
9. Detached from their Corps ..	7,089	..	73	..
Total ..	99,307	72,326	790	3,628

	Ratio per 1,000 of Strength.					
	1872.			1870–71.*		
	Admitted into Hospital.	Died.	Constantly Sick.	Admitted into Hospital.	Died.	Constantly Sick.
1. Seaport Towns	776	11·39	38·26	773	9·16	37·68
2. Dockyards and Arsenals ..	886	6·84	44·96	937	8·23	43·48
3. Camps	743	7·45	36·30	812	7·97	36·74
4. Large Manufacturing Towns	864	7·03	46·35	841	9·97	41·65
5. London and Windsor	834	6·39	51·11	713	8·70	43·12
6. Dublin	861	9·57	51·89	817	12·70	45·11
7. Remaining Stations ..	768	6·39	35·43	790	8·28	35·64
8. Autumn Manœuvres ..	351	5·33	14·38	..	..	..
9. Men detached from their Corps	..	10·72	..	..	12·92	..
Total	784	7·95	39·34	813	9·01	38·69

* For reasons stated in the Report for 1871, it has been deemed advisable, instead of comparing the results for the year under review with those for the preceding ten years, to confine the comparison to the results for the period since the re-distribution of the groups in 1870, consequent on the abolition of the Depôt Battalions in 1869.

The admissions and mean daily sick were considerably above the average of the two preceding years, and the mortality considerably below it, at London, Dublin, and the Large Manufacturing Towns. There was also a trifling increase in the admissions at the Seaport Towns. At the Dockyards, Camps, and Remaining Stations, they were below the average. The ratio of deaths was lower everywhere, except at the Seaport Towns, the reduction being greatest in the three groups above-mentioned.

The mean daily sick was higher everywhere, except at the Camps and Remaining Stations.

The ratios of sickness and mortality among the men employed in the Autumn Manœuvres are much below those for any of the other groups; but, while this affords satisfactory proof that the precautions taken for the preservation of the health of the men so employed were effectual, it must be borne in mind, in comparing these ratios with those for the other groups, that only picked and healthy men were employed in the Manœuvres,—that the duration of the Manœuvres was limited, and the season occupied by them favourable,—that under such circumstances men seldom seek admission into hospital for slight ailments,—and that of the more serious results which sometimes follow exposure on such service, a considerable proportion generally manifest themselves after the return of the force to quarters.

The admissions and deaths from the various classes and orders of diseases at each group of stations are shown in the following Table:—

Orders.	Groups of Stations	Seaports.		Dockyards and Arsenals.		Camps.		Manufacturing Towns.		London and Windsor.		Dublin.		Remaining Stations.		Autumn Manœuvres.		Men detached from their Corps.
	Average Strength	15,628		12,568		22,670		4,552		5,478		4,914		24,530		1,878		7,089
	Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Died.
	I. *General Diseases.*																	
1	Febrile Group	805	15	1,055	5	862	12	231	...	224	3	233	7	1,050	21	42	...	4
2	Constitutional ,,	2,058	51	1,717	29	3,112	54	825	16	1,584	12	1,218	12	3,416	47	114	1	31
	II. *Local Diseases.*																	
	Diseases of the—																	
1	Nervous System	166	9	158	5	219	13	41	1	62	1	48	5	300	10	13	...	7
2	Eye	220	...	164	...	498	...	70	...	42	...	61	...	380	...	32	...	...
3	Ear	70	...	59	...	66	...	12	...	7	...	16	...	78	...	...	...	...
4	Nose	6	...	3	...	5	...	...	...	2	...	1	...	17	...	...	...	...
5	Circulatory System	279	25	207	10	466	41	49	4	43	6	56	8	250	23	12	3	9
6	Absorbent ,,	137	...	180	...	257	...	84	...	68	...	87	...	292	...	18	...	...
7	Ductless Glands	...	...	...	...	...	...	...	...	...	...	...	...	2	...	1	...	...
8	Respiratory System	1,378	33	1,156	17	1,769	21	296	3	372	8	361	5	1,703	16	23	1	5
9	Digestive ,,	1,419	15	1,564	8	1,955	4	419	2	607	2	432	4	2,476	10	77	2	8
10	Urinary ,,	2,001	4	1,547	3	2,417	3	669	...	516	...	793	2	2,525	5	52	...	3
11	Generative ,,	171	...	159	...	289	...	71	...	48	...	81	...	264	...	10	...	...
12	Organs of Locomotion	101	2	52	...	106	1	29	...	32	...	14	...	149	1	4	...	...
13	Cellular Tissue	247	...	383	...	411	2	100	...	165	1	104	...	520	...	38	...	1
14	Cutaneous System	1,442	...	1,216	...	2,265	...	477	...	382	...	372	...	2,551	...	62	...	...
	III. *Conditions, &c.*																	
	Debility	72	...	114	...	139	...	41	...	20	...	23	...	92	1	7	...	...
	IV. *Poisons*	52	3	27	1	29	2	12	2	16	1	8	...	56	2	2	...	...
	V. *Injuries.*																	
2	Accidental	1,469	15	1,323	4	1,945	8	502	3	370	...	322	2	2,684	15	152	2	7
3	Homicidal	1	1	1	1	...	...	...	...	...	...	...	...	...	1	...	...	...
4	Self-inflicted	4	5	2	2	9	3	...	1	3	1	1	2	4	5	...	...	...
6	Judicial	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
	VI. *Surgical Operations*	10	...	10	1	3	...	2	...	4	...	...	...	7	...	...	...	...
	Not known	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...
	No Appreciable Disease	15	...	44	...	15	...	4	...	1	...	1	...	16	...	...	...	...
	Total	12,123	178	11,141	86	16,837	169	3,934	32	4,568	35	4,232	47	18,832	157	659	10	76

Ratio per 1.000 of Mean Strength.

Orders.	Groups and Stations / Diseases.	Seaports.		Dockyards and Arsenals.		Camps.		Manufacturing Towns.		London and Windsor.		Dublin.		Remaining Stations.		Autumn Manœuvres.		Men detached from their Corps.
		Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Died.
	I. *General Diseases.*																	
1	Febrile Group	51·5	·96	83·9	·40	38·0	·53	50·7	...	40·9	·55	47·4	1·42	42·8	·86	22·4	...	·56
2	Constitutional „	131·7	3·26	136·6	2·31	137·3	2·38	181·2	3·51	289·1	2·19	247·9	2·44	139·2	1·91	60·7	·53	4·37
	II. *Local Diseases.*																	
	Disease of the—																	
1	Nervous System	10·6	·58	12·6	·40	9·7	·57	9·0	·22	11·3	·18	9·8	1·02	12·2	·41	6·9	...	·99
2	Eye	14·1	...	13·0	...	22·0	...	15·4	...	7·7	...	12·4	...	15·5	...	17·0	...	...
3	Ear	4·5	...	4·7	...	2·9	...	2·6	...	1·3	...	3·2	...	3·2	...	...	...	...
4	Nose	·4	...	·2	...	·2	...	...	...	·4	...	·2	...	·7	...	...	...	...
5	Circulatory System	17·8	1·30	16·5	·79	20·6	1·81	10·8	·88	7·9	1·10	11·4	1·63	10·2	·94	6·4	1·60	1·27
6	Absorbent „	8·8	...	14·3	...	11·3	...	18·5	...	12·4	...	17·7	...	11·9	...	9·6	...	...
7	Ductless Glands	...	...	...	...	...	...	...	...	...	...	...	...	·1	...	·5	...	...
8	Respiratory System	88·2	2·11	92·0	1·35	78·0	·93	65·0	·66	67·9	1·46	73·5	1·02	69·4	·65	12·3	·53	·71
9	Digestive „	90·8	·96	124·4	·64	86·2	·18	92·0	·44	110·8	·37	87·9	·81	100·9	·41	41·0	1·07	1·13
10	Urinary „	128·0	·26	123·1	·24	106·6	·35	147·0	...	94·2	...	161·4	·41	102·9	·20	27·7	...	·42
11	Generative „	10·9	...	12·7	...	12·8	...	15·6	...	8·8	...	16·5	...	10·8	...	5·3	...	...
12	Organs of Locomotion	6·8	·13	4·1	...	4·7	·04	6·4	...	5·8	...	2·8	...	6·1	·04	2·1	...	...
13	Cellular Tissue	15·8	...	30·5	...	18·1	·09	22·0	...	30·1	·18	21·2	...	21·2	...	20·2	...	·14
14	Cutaneous System	92·3	...	96·8	...	99·9	...	104·8	...	69·7	...	75·7	...	104·0	...	33·0	...	...
	III. *Conditions, &c.*																	
	Debility	4·6	...	9·1	...	6·1	...	9·0	...	3·7	...	4·7	...	3·7	·04	3·7	...	...
	IV. *Poisons*	3·3	·19	2·1	·08	1·3	·09	2·6	·44	2·9	·18	1·6	...	2·3	·08	1·1	...	...
	V. *Injuries.*																	
2	Accidental	94·0	·96	105·3	·32	85·8	·35	110·3	·66	67·5	...	65·5	·41	109·4	·61	81·0	1·07	·99
3	Homicidal	·1	·06	·1	·08	...	...	...	...	...	...	...	...	...	·04	...	...	...
4	Self-inflicted	·2	·32	·2	·15	·4	·13	...	·22	·6	·18	·2	·41	·2	·0	...	...	...
6	Judicial	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	·14
	VI. *Surgical Operations*	·6	...	·8	·08	·1	...	·4	...	·7	...	...	...	·3	...	...	...	...
	Not known	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	·53	...
	No Appreciable Disease	1·0	...	3·5	...	·7	...	·9	...	·2	...	·2	...	·7	...	...	...	...
	Total	775·7	11·39	886·5	6·84	742·7	7·45	864·2	7·03	833·9	6·39	861·2	9·57	767·7	6·39	350·9	5·33	10·72

United Kingdom.

GENERAL DISEASES.—There was an increase in the prevalence of the febrile group at the Seaports and Dublin, and a decrease at all the other groups of stations.

Constitutional affections were more prevalent at all the groups, except the Dockyards and Arsenals.

The ratio of admissions from the febrile group was highest at the Dockyards, Seaports, and Manufacturing Towns, and lowest at the Camps, and London and Windsor. That from the constitutional group was highest at London and Windsor, Dublin, and the Manufacturing Towns, and lowest at the Seaports, Dockyards and Arsenals, and Camps.

The ratio of admissions and deaths at each group of stations from the several orders included in the class of General Diseases was as follows :—

General Diseases.		Annual Ratio per 1,000 of Mean Strength.								
		Seaport Towns.	Dockyards and Arsenals.	Camps.	Large Manufacturing Towns.	London and Windsor.	Dublin.	Remaining Stations.	Autumn Manœuvres.	Men Detached from their Corps.
Febrile.										
Eruptive Fevers.	Admitted	5·6	7·9	4·3	2·6	3·7	9·2	6·0	·5	...
	Died ...	·38	·08	·04	...	...	1·02	·29	...	·56
Continued „	Admitted	18·2	26 6	17·9	33·2	23·0	26·9	17·6	14·4	...
	Died ...	·51	·24	·40	...	·37	·40	·37	...	...
Paroxysmal „	Admitted	22·5	38·3	5·7	6·6	1·1	2·6	9·6	5·9	...
	Died ...	...	...	...	...	...	...	...	..	...
Influenza... ...	Admitted	2·1	5·9	6·4	6·1	10·2	5·3	6·4	·5	...
	Died ...	...	...	...	...	...	...	...	...	...
Erysipelas ...	Admitted	2·5	3·3	1·5	1·1	1·6	·8	1·8	1·1	...
	Died ...	·06	·08	·04	...	...	...	·12	...	...
Other Febrile Affections ...	Admitted	·6	1·9	2·2	1·1	1·3	2·6	1·4	...	...
	Died ...	...	...	·04	...	·18	...	·08	...	...
Total of Febrile Group ...	Admitted	51·5	83·9	38·0	50·7	40·9	47·4	42·8	22·4	...
	Died ...	·95	·40	·52	...	·55	1·42	·86	...	·56
Constitutional.										
Rheumatism ...	Admitted	41·5	53·2	46·3	36·9	38·7	35·8	39·5	25·0	...
	Died ...	·06	·08	·04	...	...	...	...	...	·14
Syphilis	Admitted	73·8	66·8	77·6	125·6	230·4	199·0	85·0	33·0	...
	Died ...	·13	·08	·04	...	...	...	...	...	·28
Scrofula, Phthisis, &c.	Admitted	14·0	12·8	11·3	14·1	15·9	11·0	11·1	2·7	...
	Died ...	2·81	2·07	2·29	3·51	2·19	2;44	1·87	...	3·67
Scurvy and Purpura	Admitted	·3	·2	·1	·2	·2	...	·2	...	...
	Died ...	...	·08	...	...	...	...	...	...	...
Anæmia	Admitted	1·1	2·1	1·1	3·3	2·3	·8	2·3	...	...
	Died ...	...	...	...	...	...	...	...	...	...
Other Constitutional Affections	Admitted	1·0	1·5	·9	1·1	1·6	1·2	1·1	...	...
	Died ...	·26	...	...	...	...	...	·04	·53	·28
Total of Constitutional Group ...	Admitted	131·7	136·6	137·3	181·2	289·1	247·8	139·2	60·7	...
	Died ...	3·26	2·31	2·37	3·51	2·19	2·44	1·91	·53	4·37

Eruptive Fevers were much less prevalent and less fatal than in 1871, the reduction extending over all the groups of stations, except the Camps, at which there was a trifling increase of prevalence, but a decrease of mortality. The particular diseases in which the reduction took place were small-pox and scarlet fever. There was a considerable increase of measles. The admissions for small-pox amounted to 131, and the deaths in hospital to 14; but four additional deaths occurred among men detached from their regiments. The ratio of admissions per 1,000 of the strength was therefore 1·42, and that of deaths ·18. The disease prevailed chiefly at Dublin, the Seaports, and the "Remaining Stations," but none of the groups escaped entirely. Its period of greatest prevalence extended over the first two quarters of the year; the admissions during the several quarters being as follows :—

1st Quarter	70	3rd Quarter	11
2nd Quarter	41	4th Quarter	9

The proportion of deaths in hospital to cases admitted was 10·69 per cent., which is higher than usual. All the men who died are reported to have borne

marks of vaccination, except one recruit at Devonport, who was attacked on joining, having been vaccinated while *en route*. In another fatal case, at Dover, the marks of vaccination being considered doubtful, the man had been re-vaccinated four days before the appearance of the eruption. In three more it was doubtful if re-vaccination had been performed.

There were 53 admissions from scarlet fever, and 2 deaths, or 3·77 per cent., a very low rate of mortality from that disease. It prevailed chiefly at Woolwich, Aldershot, Edinburgh, Winchester and Alderney.

From measles there were 204 admissions and 4 deaths, the proportion of deaths to admissions being, therefore, 1·96 per cent. The stations at which this disease chiefly prevailed were Aldershot, the Curragh, Portsmouth, Chatham and Fermoy. The admissions from scarlet fever and measles during the several quarters of the year were as follows :—

	Number of Admissions.	
	Scarlet Fever.	Measles.
Ist Quarter	25	75
IInd Quarter ..	13	81
IIIrd Quarter ..	5	28
IVth Quarter ..	10	20

Continued Fevers were more prevalent than during the preceding year at the Manufacturing Towns, Dublin, the Seaports, and London and Windsor, the increase at the first two groups being considerable, and that at the last two slight. They were greatly less prevalent at the Camps, and their prevalence was reduced, but in a less degree, at the Dockyards and Arsenals, and Remaining Stations. The ratio of admissions was highest at the Manufacturing Towns and, after them, at Dublin and the Dockyards and Arsenals. That of mortality was highest at the Seaports, but it was everywhere very low. At the Manufacturing Towns, where the admissions were most numerous, there were no deaths. The great majority of the admissions were for simple continued fever and febricula, the latter in many cases being the result of intemperance.

Typhus Fever caused 6 admissions into hospital, and 2 deaths. Of the admissions 2 were at Dublin, and 1 at each of the following stations,—London Weedon, Birr, and Clonmel. The fatal cases were those at the last two stations.

Enteric Fever caused rather fewer admissions than in 1871, but the same number of deaths—viz., 22. None of the groups of stations were exempt from it, but at none of them were the admissions very numerous. Their number, and that of the deaths at each group are shown in the following list :—

	Seaports.	Dockyards and Arsenals.	Camps.	Large Manufacturing Towns.	London and Windsor.	Dublin.	Remaining Stations.	Autumn Manœuvres.
Admissions for Enteric Fever	10	7	8	3	8	13	28	1
Deaths from Enteric Fever	6	3	7	..	1	..	5	..

It is obvious that the high ratio of mortality shown at the first three groups can only be the result of many cases of enteric fever having been returned under other heads, and that the apparent reduction in the prevalence of the disease at the Camps in particular, where 40 admissions and 9 deaths

United Kingdom.

were reported from it in 1871, is to be explained in that way. At each of these groups the admissions for simple continued fever were numerous.*

One case of cerebro-spinal fever occurred at Dublin, and one of relapsing fever at Edinburgh. Neither proved fatal.

Paroxysmal Fevers were considerably more prevalent than in 1871, the increase being chiefly at the Seaports, and Dockyards and Arsenals. The particular stations at which the admissions were most numerous were Portsmouth, Dover, Woolwich, Chatham, and Sheerness, but the great majority of the attacks, except at the last-named station, were, as in former years, relapses of disease contracted in the tropics. The annual fluctuations in their number at particular stations depend more on changes in the constitution of the force at each, than on climatic or local causes.

Rheumatism was less prevalent at all the groups, except the Seaports, at which there was a slight increase, the general result for the whole force being a considerable reduction.

Syphilis was more prevalent than in 1871 at the Seaports, Camps, London and Windsor, Dublin, and the Remaining Stations, and less so at the Dockyards and Arsenals, and the Large Manufacturing Towns. The result for the whole force in the United Kingdom was an increase of 9·73 per 1,000 of the strength in the ratio of admissions, 6·84 of that amount being in primary syphilis, and 2·88 in secondary syphilis.

The ratio of admissions at London and Windsor, and Dublin, was nearly three times, and that at the Large Manufacturing Towns, though reduced, nearly twice that at the Seaports, Dockyards and Arsenals, and Camps. The ratio for the men employed in the Autumn Manœuvres, was less than half that at any of the other groups, but still perhaps higher than might have been expected under the circumstances.

The ratio of admissions for primary venereal sores per 1,000 of the mean strength at all the large stations in the United Kingdom during the last six years is shown in the following Table:—

Stations.	Admissions into Hospital per 1,000 of Mean Strength for Primary Venereal Sores in					
	1867.	1868.	1869.	1870.	1871.	1872.
Devonport and Plymouth ..	76	66	74	58	50	59
Portsmouth	116	86	62	51	41	40
Chatham and Sheerness ..	71	63	41	47	65	49
Woolwich	88	46	52	43	58	60
Aldershot	91	77	63	67	65	62
Windsor	58	136	93	67	78	96
Shorncliffe	42	77	60	100	30	33
Colchester	145	182	85	42	32	55
Winchester	52	104	101	61	29	57
Dover	132	111	80	30	24	47
Canterbury	119	114	45	152	38	43
Maidstone	242	122	128	68	44	57
Cork	72	61	73	68	55	62
Curragh	104	85	88	56	35	50
Isle of Wight	59	103	129	64	66	57
London	163	148	144	160	190	199
Warley	74	92	61	55	57	66
Hounslow	62	106	85	88	45	90
Pembroke Dock	28	35	51	54	28	27
Sheffield	163	107	146	77	126	98
Manchester	177	115	160	92	70	98

* From the figures on page 18 it will be seen that in a few cases the requisite correction was made in the Regimental Annual Returns.

United Kingdom.

Stations.	Admissions into Hospital per 1,000 of Mean Strength for Primary Venereal Sores in					
	1867.	1868.	1869.	1870.	1871.	1872.
Preston	87	87	172	134	75	114
Edinburgh	63	46	60	99	69	43
Fermoy	70	47	116	89	33	56
Limerick	117	114	54	136	57	100
Athlone	85	38	42	44	47	14
Dublin	129	139	180	128	117	165
Belfast	89	56	52	43	61	78

Of the stations under the operation of the Contagious Diseases Act, which are those above the line in the table, only three show a reduction in the prevalence of primary venereal sores—Portsmouth, Chatham, and Aldershot; and at the first and last the reduction was very trifling. At all the other stations in this group there was an increase, and at Windsor, Colchester, Winchester, Dover, Maidstone and the Curragh the increase was considerable.

Of the stations not under the Act, which are those below the line, five show a reduction—viz., the Isle of Wight, Pembroke Dock, Sheffield, Edinburgh and Athlone, and at all except the second the reduction was considerable. The increase at the remaining nine stations was, however, in a higher proportion, Hounslow, Manchester, Preston, Fermoy, Limerick, Dublin and Belfast being those at which it was most marked. Taking all the stations in each group together, the ratio of admissions for primary venereal sores per 1,000 of the strength was 54·18 at those under the Contagious Diseases Act, and 123·15 at those not under it, those ratios being respectively 3·10 and 29·70 above the corresponding ratios for 1871.

The ratio of admissions at London and Dublin greatly exceeded that at any of the other stations, but there was a very high ratio also at Preston, Limerick, Sheffield, Manchester, and Windsor. The periodical relief of the Battalion of Guards at the last-named station by one from London no doubt accounts to some extent for the excess there.

The question as to the efficacy of the Contagious Diseases Act in reducing the prevalence of venereal diseases in the army having excited much public interest, and detailed information on the subject having been applied for, the Tables which follow, and the accompanying explanatory remarks, were drawn up by Surgeon-General Balfour, F.R.S., in May 1873, and submitted to the House of Commons by the Secretary of State for War:—

"TABLES relative to the Working of the Contagious Diseases Act as regards the Army, comprising the Results obtained from the Returns of 28 Stations in the United Kingdom, being all the Stations at which the Force was 500 Men and upwards, as furnished by the War Department to the Secretary of State for the Home Department.

"I.

"TABLES showing the Admissions into Hospital for Primary Venereal Sores and Gonorrhœa at 28 Stations of Troops in the United Kingdom in each Year

United Kingdom.

"NOT UNDER THE CONTAGIOUS DISEASES ACT.

Year.	Average Strength.	Primary Venereal Sores.	Gonorrhœa.	Ratio per 1,000. Primary Venereal Sores.	Ratio per 1,000. Gonorrhœa.
1864	60,681	6,590	6,828	108·6	112·5
1865	55,167	5,346	6,253	99·9	113·3
1866	49,150	4,469	4,882	90·9	99·3
1867	36,439	3,936	4,794	108·0	131·6
1868	34,311	3,662	4,406	106·7	128·4
1869	27,401	3,066	2,809	111·9	102·5
1870	17,852	2,022	1,723	113·3	96·5
1871	19,957	1,865	2,137	93·4	107·4
1872	19,950	2,457	2,113	123·1	105·9
Totals of 8 Years ..	260,227	26,823	29,117	..	..
Average, 1865—72 ..	32,528	3,353	3,640	103·1	111·9

"UNDER CONTAGIOUS DISEASES ACT.

Year.	Average Strength.	Primary. Venereal Sores.	Gonorrhœa.	Ratio per 1,000. Primary Venereal Sores.	Ratio per 1,000. Gonorrhœa.
1865	7,393	887	1,039	120·0	140·5
1866	10,161	920	1,676	90·5	164·9
1867	24,061	2,076	3,150	86·3	130·9
1868	27,770	2,001	3,515	72·1	126·9
1869	32,355	1,972	3,513	60·9	108·6
1870	41,580	2,268	4,081	54·5	98·1
1871	54,090	2,763	6,254	51·1	115·6
1872	50,794	2,752	5,280	54·2	104·0
Totals of 8 Years ..	248,210	15,639	28,508	..	..
Average, 1865—72 ..	31,026	1,955	3,563	63·0	114·8

"II.

"TABLE showing the Number constantly in Hospital with Primary Venereal Sores at 28 Stations of Troops in the United Kingdom, in each Year from 1868 to 1872 inclusive.

Year.	Under Acts. Strength.	Under Acts. Primary Venereal Sores.	Under Acts. Ratio per 1,000.	Not under Acts. Strength.	Not under Acts. Primary Venereal Sores.	Not under Acts. Ratio per 1,000.
1868..	27,770	141·38	5·09	34,311	275·65	8·03
1869..	32,355	158·10	4·89	27,401	258·04	9·41
1870..	41,580	185·58	4·46	17,852	173·87	9·74
1871..	54,096	210·43	3·89	19,957	161·09	8·07
1872..	50,794	231·55	4·56	19,950	225·21	11·14
Totals	206,595	927·04	..	119,471	1093·86	..
Average	41,319	185·41	4·49	23,894	218·77	9·16

"These Tables show clearly the operation of the Contagious Diseases Acts; they comprise the results obtained from the returns of 28 stations in the United Kingdom, being all the Stations at which the force was 500 men and upwards. *United Kingdom.*

"In 1864, the year in which a Contagious Diseases Act was first passed, and the year before it came into operation, the admissions into hospital at these 28 stations were in the ratio of 108·6 for primary venereal sores, and 112·5 for gonorrhœa, per 1,000 of mean strength. In 1872 the admissions were 54·2 and 104·0 respectively at the 14 stations under the operation of the Act, showing a reduction of 54·4 per 1,000 in primary venereal sores, or that form of disease which is likely to produce great constitutional deterioration, and of 8·5 per 1,000 in gonorrhœa.

"Again, if the average of the eight years during which the Acts have been in operation be taken, it will be seen that at the stations not under the Act, in an average force of 32,500, the ratio of admissions for primary venereal sores was 103·1 per 1,000, and for gonorrhœa 111·9 per 1,000; while at the Stations under the Act, in an average force of 31,000 men, the proportions were 63·0 and 114·8 per 1,000 respectively. These results show a difference in favour of the Stations under the Act of 40·1 per 1,000 in the case of primary venereal sores, and an excess of 2·9 per 1,000 in cases of gonorrhœa.

"Or again, if the results for 1872 alone be compared, they show the admissions at the Stations under the Act to have been 54·2 per 1,000 for primary venereal sores, and 104·0 for gonorrhœa; while at those not under the Act they were 123·1 and 105·9 per 1,000 respectively, showing a difference of 68·9 per 1,000 in venereal sores, and 1·9 per 1,000 in gonorrhœa, in favour of the Stations under the Act. At both groups of Stations there was an increase in the amount of primary venereal sores in 1872 compared with the results of 1871, but it was only 3·1 per 1,000 at the Stations under the Act, while it amounted to 29·7 per 1,000 at those not under the Act. In gonorrhœa there was a reduction in both groups of Stations, but much greater at those under the Act.

"Table H. shows the average constantly in hospital for primary venereal sores at the two groups of Stations during the last five years. At the Stations under the Act there was a steadily progressive reduction in the first four years, but an increase, concurrent with the increase in the admissions, in 1872. At those not under the Act there was an increase in the second and third years, a decrease in the fourth, and a marked increase in the fifth year.

"On the average of the five years the proportion per 1,000 of mean strength constantly in hospital with primary venereal sores, at the stations not under the Act, was rather more than double that of the Stations under the Act."

Scrofula and Phthisis.—The ratio of admissions into hospital for these diseases was higher at all the groups of stations except the Camps and Dublin, at both of which it was the same as in 1871. That of deaths was higher at the Seaports, Camps, and London and Windsor, and lower at all the other groups. The admissions and deaths in the whole force were respectively in the ratio of 12·12, and 2·36 per 1,000 of the strength; the former being ·96 above, and the latter ·10 below the corresponding ratio for 1871.

Local Diseases.—*Diseases of the Nervous System* prevailed to nearly the same extent as in 1871 at all the groups, but the mortality from them was rather less, the reduction being greatest at London.

In the prevalence of affections of the *eye*, *ear*, and *nose*, there was very little change.

Diseases of the Circulatory System were much more prevalent than in 1871, the increase extending over all the groups, but the mortality from them was less everywhere except at the Seaports, the Camps, and Dublin.

Diseases of the Respiratory System were slightly less prevalent, but greatly more fatal at the Seaports, the increase of mortality being due to pneumonia, chiefly at Portsmouth and Dover. At all the other groups they were less prevalent, and at all except the Dockyards and Arsenals they were also less fatal.

United Kingdom.

Diseases of the Digestive System were less prevalent at the Dockyards and Arsenals, Camps, and Remaining Stations, and more so at all the other groups. The mortality from them was much lower than in 1871 at the Camps, the reduction being chiefly in hepatitis, considerably lower at the Remaining Stations, the same at London and Dublin, and higher at the other groups.

Urinary diseases were more prevalent than during the preceding year at London and Dublin, the increase being in gonorrhœa and its sequelæ, and less so at all the other groups. In the mortality from this order, which is always chiefly caused by Bright's disease, there was little change. The ratio was higher at the Camps and Remaining Stations, and lower at the Seaports, Dockyards and Arsenals, and Dublin. At London and the Large Manufacturing Towns there were no deaths from this order.

The relative prevalence of gonorrhœa at the stations under the operation of the Contagious Diseases Act, and at those not under it, has been already shown in the tables on page 8, framed by Surgeon-General Balfour. The results shown by the Returns for 1872, as to the efficacy of the Act in reducing the prevalence of that disease, are much the same as those recorded in several former Reports. It is doubtful if any benefit at all is to be ascribed to it. The excess of the reduction at the stations under the Act over that at those not under it is, of course a favourable result so far as it goes, but it may have been accidental; and the fact remains that the average ratio of admissions for the eight years from 1865 to 1872 was higher at the protected than at the unprotected stations. It must, therefore, be admitted that, so far as appears from the evidence furnished by the Returns, but little influence has as yet been produced on the prevalence of gonorrhœa by the measures which have been so undoubtedly efficacious in reducing that of primary venereal sores, the far more serious form of venereal disease, from which constitutional contamination and ultimate inefficiency so often result. But it may be added that it was not to be expected that the Returns would furnish as strong evidence of the beneficial working of the Act in the case of gonorrhœa as in that of primary venereal sores, not only because the former disease is so much more difficult of detection in the female than the latter, but still more because relapses of gonorrhœa in soldiers are of very frequent occurrence, and several admissions often result from one infection, while in primary venereal sores relapse is a very rare occurrence.

Poisons.—The admissions into hospital for delirium tremens and alcoholic poisoning were in the following proportions per 1,000 of the mean strength at the different groups:—

Seaports.	Dockyards and Arsenals.	Camps.	Large Manufacturing Towns.	London and Windsor.	Dublin.	Remaining Stations.	Autumn Manœuvres.
3·33	2·15	1·28	2·64	2·92	1·63	2·28	1·06

Injuries were considerably less numerous than in 1871 at the Camps, but rather more so at all the other groups except the Dockyards and Arsenals, at which there was scarcely any change. Of the 56 accidental deaths, 28 were by drowning, 10 from fracture, 9 from multiple injury, 3 from injury of the brain, 2 from poisoning (both at Aldershot, 1 by chloroform administered for a surgical operation, the other by cyanide of potassium, taken by mistake), 2 from rupture of internal organs, and 1 from asphyxia, caused by a piece of meat in the wind-pipe. Three deaths occurred by homicide, one at Dover from a stab by a bayonet, one at Sheerness from effusion of blood on the surface of the brain, caused by a blow in a fight, the third at Dunmore from fracture of the leg, followed by blood poisoning. The deaths by suicide were less numerous than during either of the two preceding years. The modes by which self-destruction was accomplished were as follows:—gunshot in 10 cases, cut-throat in 5, hanging in 2, poisoning by cyanide of potassium in

1, and jumping over Waterloo Bridge in 1. One man was hanged at Maidstone for murder. *United Kingdom.*

CAUSE OF DEATH UNKNOWN.—One case was unavoidably returned under this head. A man of the Royal Artillery, employed in the Autumn Manœuvers, fell dead on the field at Winterbourn, on the 6th of September, it was believed from disease of the heart; but the verdict of the Coroner's inquest was simply "died by the visitation of God," and no further information as to the result of the post-mortem examination could be procured.

The following Table* shows the admissions and deaths and the number invalided in each arm of the service in 1872, with their ratios per 1,000 of the strength, and the corresponding ratios for the ten years from 1862 to 1871, those corps only being included which were present during the whole of the year:—

	Average Strength.	Admitted into Hospital.	Died in and out of Hospital.	Discharged as Invalids.	Annual Ratio per 1,000 of Strength.			1862-71. Annual Ratio per 1,000.		
					Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.
Household Cavalry	1,200	752	3	17	627	2·50	14·16	628	8·15	16·47
Dragoon Guards & Dragoons ..	10,532	8,182	61	311	777	5·79	29·53	815	7·07	27·45
Royal Artillery ..	12,957	12,051	99	404	930	7·64	31·19	901	8·33	†30·89
Royal Engineers..	3,720	..	28	53	..	7·53	14·26	..	6·56	7·69
Foot Guards ..	6,181	4,393	49	128	711	7·92	20·71	772	7·84	26·70
Infantry Regts. ..	44,551	29,840	336	1,057	670	7·54	23·72	767	7·78	27·25
Army Hosp. Corps	597	..	6	15	..	10·04	25·11	..	..	..
Army Service „	2,529	..	25	28	..	9·89	11·07	..	..	..
Depôt Brig., R.A..	2,614	2,920	21	109	1,117	8·03	41·70	1,049	9·55	†23·91
Coast Brig., R.A..	1,509	..	31	9	..	20·52	5·96	..	18·32	8·66
Depôts	7,687	6,877	95	526	895	12·35	68·43	923	10·92	36·36

The ratio of admissions exceeded that for the preceding year in the Dragoon Guards and Dragoons, the Foot Guards, and the Depôts; and was below it in the Household Cavalry, the Royal Artillery, the Infantry Regiments, and the Depôt Brigade Royal Artillery. In all the arms except the Royal Artillery and the Depôt Brigade Royal Artillery, it was below the average of the preceding ten years.

The ratio of deaths exceeded that for 1871 in the Royal Engineers, the Depôt Brigade Royal Artillery, and the Depôts, and was below it in all the other arms. It was below the average of the preceding 10 years in the Household Cavalry, the Dragoon Guards and Dragoons, the Royal Artillery, the Infantry Regiments, and the Depôt Brigade Royal Artillery; and above it in the Royal Engineers, the Foot Guards, the Coast Brigade Royal Artillery, and the Depôts.

The ratio of invaliding was higher than that for 1871 in the Household Cavalry, the Dragoon Guards and Dragoons, the Royal Artillery, the Infantry Regiments, the Army Service Corps, the Depôt Brigade Royal Artillery, and the Depôts; and below it in the Royal Engineers, the Foot Guards, the Army Hospital Corps, and the Coast Brigade Royal Artillery. Compared with the average for the previous ten years, it was in excess in the Dragoon Guards and Dragoons, the Royal Artillery, the Royal Engineers, the Depôt Brigade Royal Artillery, and the Depots, and reduced in the Household Cavalry, the Foot Guards, the Infantry Regiments, and the Coast Brigade Royal Artillery.

* Compiled from the Regimental Annual Returns.

† The average of seven years, 1865-71, as prior to 1865 it was impossible to separate the Invalids of the Brigades serving at Home from those of the Depôt Brigade.

United Kingdom.

On adding to the strength of each arm one-half of the number of men belonging to it placed on the pension list during the year, and to the mortality in it, the deaths among the men so pensioned which occurred before the 31st December, on the principle explained in former Reports, the following results are obtained:—

	1872.			1862-71.
	Average Strength corrected as above.	Deaths of Soldiers and Pensioners.	Ratio of Deaths per 1,000 of Strength.	Ratio of Deaths of Soldiers and Pensioners per 1,000 of Strength.
Household Cavalry	1,222	6	4·91	10·25
Cavalry of the Line	10,690	77	7·22	8·04
Royal Artillery	13,346	125	9·37	9·45
Foot Guards	6,257	55	8·79	10·19
Infantry Regiments	45,117	381	8·44	9·09

Compared with the results for 1871, and those for the previous ten years, this Table shows a reduction of mortality in all the arms, the reduction in either case being greatest in the Household Cavalry, and lowest in the Royal Artillery. The same two arms furnished the lowest and highest ratios of mortality in 1871, but the difference between them, which in that year was only one per 1,000 of the strength, was in 1872, 4·46, the ratio in the Household Cavalry being less than half the average for the preceding ten years.

The admissions, deaths, and invaliding in each arm of the service from the different classes and orders of diseases, are shown in the following Tables, framed from Abstract No. 1 in the Appendix:—

Orders.		Household Cavalry.			Cavalry.			Royal Artillery.			Foot Guards.			Infantry Regiments.			Depôt Brigade Royal Artillery.			Depôts.			Royal Engineers.		Coast Brigade, R. A.		Army Hospital Corps.		Army Service Corps.	
	Strength	1,200			10,532			12,957			6,181			44,551			2,614			,687			3,720		1,509		597		2,529	
	Diseases.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Died.	Invalided.	Died.	Invalided.	Died.	Invalided.	Died.	Invalided.
	I. *General Diseases.*																													
1	Febrile Group ...	18	...	...	336	6	1	702	7	3	268	4	...	1,858	34	1	320	1	4	364	7	5	1	...	...	...	...	...	1	...
2	Constitutional ,, ...	148	2	11	1,724	17	94	2,019	25	109	1,586	18	53	5,665	122	336	395	4	23	1,247	26	142	7	20	8	4	4	7	8	4
	II. *Local Diseases.* Diseases of the—																													
1	Nervous System... ...	18	...	1	76	4	27	180	5	49	52	2	14	402	17	116	50	1	9	153	13	62	1	4	5	2	...	2	3	7
2	Eye	8	...	...	128	...	4	168	...	9	36	...	3	786	...	33	29	...	2	165	...	15	...	2	...	...	...	...	...	1
3	Ear	...	...	...	12	...	3	54	...	6	9	...	1	149	...	15	13	...	2	31	...	5	...	1	...	...	...	1	...	...
4	Nose	...	...	...	4	...	...	10	...	...	3	...	...	14	...	1	...	...	...	4	...	1	...	...	...	...	...	...	...	...
5	Circulatory System ...	1	...	2	109	10	51	242	24	87	49	7	26	588	42	213	61	4	19	172	16	83	7	9	5	...	1	...	7	4
6	Absorbent ,, ...	10	...	...	136	...	...	189	...	...	73	...	1	479	...	2	48	...	...	80	...	...	...	...	...	...	...	...	...	...
7	Ductless Glands... ...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
8	Respiratory System ...	96	1	...	690	7	11	1,173	11	26	316	10	10	3,055	48	77	250	4	5	762	13	27	4	...	5	1	...	1	3	1
9	Digestive ,, ...	134	...	...	866	5	35	1,405	6	46	550	4	5	3,529	25	77	464	2	20	991	7	74	...	4	4	2	1	1	...	...
10	Urinary ,, ...	62	...	...	1,099	2	6	1,935	4	12	514	...	3	4,479	9	23	523	...	2	953	2	14	1	3	2	...	...	1	1	3
11	Generative ,, ...	10	...	1	159	...	10	218	...	5	48	...	...	400	...	4	43	...	...	86	...	1	...	...	...	...	...	...	...	...
12	Organs of Locomotion ...	3	...	...	61	...	13	70	2	12	30	...	5	212	...	43	15	...	8	50	...	19	...	3	...	...	...	...	...	...
13	Cellular Tissue	35	...	1	231	...	2	367	...	3	158	1	1	774	2	2	51	...	...	133	1	...	...	...	...	...	...	...	...	...
14	Cutaneous System ...	93	...	...	1,216	...	14	1,405	...	8	334	...	...	3,717	...	16	336	...	2	895	...	13	...	1	...	...	...	...	...	2
	III. *Conditions, &c.*																													
	Debility	2	...	1	48	...	14	75	...	12	22	...	4	176	...	61	44	...	8	117	1	56	...	1	...	...	...	2	...	...
	IV. *Poisons.*	...	...	...	20	...	...	22	1	...	21	1	...	83	6	...	6	...	...	15	1	...	...	...	1	...	...	...	...	...
	V. *Injuries.*																													
2	Accidental	113	...	...	1,247	5	25	1,780	13	14	317	...	1	3,533	22	32	263	2	1	647	6	9	5	...	1	...	...	...	1	4
3	Homicidal	...	...	...	...	1	...	...	...	...	...	...	...	...	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...
4	Self-inflicted	1	...	...	5	4	...	1	1	...	2	2	...	10	6	3	1	...	...	...	2	...	2	...	...	...	...	...	1	...
6	Judicial	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	VI. *Surg. Operations* ...	...	...	...	3	...	1	13	...	1	5	...	1	8	...	2	3	1	5	...	...	...	...	...	...	...	...	...	...	...
	Not known	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...
	No appreciable disease ...	...	...	...	5	...	...	26	...	...	...	...	...	28	...	...	5	...	...	12	...	...	...	...	...	...	...	...	...	...
	Total	752	3	17	8,182	61	311	12,054	99	404	4,393	49	128	29,846	336	1057	2,920	21	109	6,877	95	526	28	53	31	9	6	15	25	28

Ratio per 1,000 of Mean Strength.

Order.	Diseases.	Household Cavalry.			Cavalry.			Royal Artillery.			Foot Guards.			Infantry Regiments.			Depôt Brigade Royal Artillery.			Depôts.			Royal Engineers.		Coast Brigade R.A.	Army Hospital Corps		Army Service Corps.	
		Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Died.	Invalided.	Died.	Died.	Invalided.	Died.	Invalided.
	I. *General Diseases.*																												
1	Febrile Group ...	15·0	...	...	31·9	·57	·10	54·2	·54	·23	43·4	·65	...	41·7	·76	·02	122·4	·38	1·53	47·4	·91	·65	·27	...	...	...	...	·40	...
2	Constitutional ,, ...	123·3	1·67	9·17	163·7	1·61	8·93	155·9	1·93	8·42	256·6	2·91	8·57	124·9	2·74	7·54	151·1	1·53	8·41	162·2	3·38	18·47	1·88	5·38	5·30	2·64	6·70	11·72	3·16	1·58
	II. *Local Diseases.* Diseases of the—																												
1	Nervous System	15·0	...	·83	7·2	·38	2·56	13·9	·39	3·78	8·4	·32	2·26	9·0	·38	2·60	19·1	·38	3·44	19·9	1·69	8·07	·27	1·07	3·31	1·33	...	3·35	1·18	2·77
2	Eye	6·7	...	...	12·2	...	·38	13·0	...	·69	5·8	...	·49	17·6	...	·74	11·1	...	·77	21·5	...	1·95	...	·54	...	...	...	...	...	·79
3	Ear	...	...	...	1·8	...	·28	4·2	...	·46	1·5	...	·16	3·3	...	·33	5·0	...	·77	4·0	...	·65	...	·27	...	...	...	1·67	...	·40
4	Nose	...	...	...	·4	...	...	·8	...	...	·5	...	...	·3	...	·02	...	...	...	·5	...	·13	...	...	...	...	...	...	...	...
5	Circulatory System ...	·8	...	1·67	10·4	·95	4·84	18·7	1·85	6·72	7·9	1·13	4·21	13·2	·94	4·78	23·3	1·53	7·27	22·4	2·08	10·80	1·88	2·42	3·31	...	1·67	...	2·77	1·58
6	Absorbent ,, ...	8·3	...	...	12·9	...	...	14·6	...	...	11·8	...	·16	10·8	...	·05	18·4	...	...	10·4	...	...	...	...	...	...	...	...	...	...
7	Ductless Glands	...	...	...	...	...	...	...	...	...	...	...	...	...	·02	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	Respiratory System ...	80·0	·83	...	65·5	·67	1·05	90·6	·85	2·01	51·1	1·62	1·62	68·6	1·08	1·73	95·6	1·53	1·91	99·1	1·69	3·51	1·07	...	3·31	·66	...	1·67	1·18	·40
9	Digestive ,, ...	111·7	...	...	82·2	·47	3·32	108·5	·46	3·54	89·0	·65	·81	79·2	·56	1·73	177·5	·77	7·65	128·9	·91	9·63	...	1·08	2·64	1·33	1·67	1·67	...	...
10	Urinary ,, ...	51·7	...	...	104·3	·19	·57	149·4	·31	·93	83·2	...	·49	100·5	·20	·52	200·1	...	·77	124·0	·26	1·82	·27	·81	1·33	...	...	1·67	·40	1·18
11	Generative ,, ...	8·3	...	·83	15·1	...	·95	16·8	...	·39	7·8	...	...	9·0	...	·08	16·5	...	...	11·2	...	·13	...	...	...	...	...	...	...	...
12	Organs of Locomotion ...	2·5	...	...	5·8	...	1·23	5·4	·15	·93	4·8	...	·81	4·8	...	·97	5·7	...	3·06	6·5	...	2·47	...	2·15	...	...	...	...	...	...
13	Cellular Tissue ..	29·2	...	·83	21·9	...	·19	28·3	...	·28	25·6	·16	·16	17·4	·05	·05	19·5	...	...	17·3	·13	...	...	...	...	...	...	...	...	...
14	Cutaneous System ...	77·5	...	...	115·5	...	1·33	108·5	...	·62	54·0	...	...	83·4	...	·36	128·5	...	·77	116·4	...	1·69	...	·27	...	...	...	...	...	·79
	III. *Conditions, &c.*																													
	Debility	1·7	...	·83	4·5	...	1·33	5·8	...	·93	3·5	...	·65	4·0	...	1·37	16·8	...	3·06	15·2	·13	7·29	...	·27	...	...	...	3·35	...	·27
	IV. *Poisons...* ...	...	...	...	1·9	...	...	1·7	·08	...	3·4	·16	...	1·9	·14	...	2·3	...	...	1·9	·13	...	...	...	·66	...	...	...	...	...
	V. *Injuries.*																													
2	Accidental	94·2	...	...	118·4	·47	2·37	137·4	1·00	1·08	51·3	...	·16	79·2	·49	·72	100·6	·77	·38	84·2	·78	1·17	1·34	...	·66	...	...	...	·40	1·58
3	Homicidal	...	...	...	...	·10	...	...	...	...	...	...	...	...	·02	...	...	·38	...	...	...	...	...	...	...	...	...	...	...	...
4	Self-Inflicted	·8	...	...	·5	·38	...	·1	·08	...	·3	·32	...	·2	·14	·06	·4	...	...	...	·26	...	·55	...	...	...	...	...	·40	...
6	Judicial	...	...	...	...	...	...	...	...	...	...	...	...	...	·02	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	IV. *Surgical Operations.*	...	...	...	·3	...	·10	1·0	...	·08	·8	...	·16	·2	...	·05	1·2	·38	1·91	...	...	...	...	...	...	...	...	...	...	...
	Not known	...	...	...	...	...	...	...	...	·15	...	...	...	...	...	...	...	·38	...	...	...	...	...	...	...	...	...	...	...	...
	No Appreciable Disease ...	...	...	...	·5	...	...	2·0	...	...	...	...	...	·6	...	...	1·9	...	...	1·6	...	...	...	...	...	...	...	...	...	...
	Total	626·7	2·50	14·16	776·9	5·79	29·53	930·8	7·64	31·19	710·7	7·92	20·71	669·9	7·54	23·72	1117·0	8·03	41·70	894·6	12·35	68·43	7·53	14·26	20·52	5·96	10·04	25·11	9·89	11·07

United Kingdom.

General Diseases.		Annual Ratio per 1,000 of Mean Strength.						
		Household Cavalry.	Dragoon Guards and Dragoons.	Royal Artillery.	Foot Guards.	Infantry Regiments.	Depôt Brigade, Royal Artillery.	Depôts.
Febrile—								
Eruptive Fevers	Admitted ..	2·5	4·6	5·8	2·8	4·8	18·7	8·0
	Died	..	·19	·08	..	·27	..	·26
Continued Fevers ..	Admitted ..	9·2	17·0	22·5	25·5	18·0	20·4	20·3
	Died	..	·19	·38	·49	·38	·38	·52
Paroxysmal Fevers ..	Admitted ..	..	1·7	18·7	1·3	11·5	65·8	10·4
	Died	..	..	..	..	..	..	..
Influenza ..	Admitted ..	2·5	5·6	4·9	11·5	4·2	10·7	5·5
	Died	..	..	..	..	..	..	..
Erysipelas ..	Admitted ..	..	2·1	1·7	1·3	1·7	6·1	1·8
	Died	..	·09	·08	..	·09	..	..
Other Febrile Diseases ..	Admitted ..	·8	·9	·6	1·0	1·5	·7	1·4
	Died	..	·09	..	·16	·02	..	·13
Total of Febrile Group ..	Admitted	15·0	31·9	54·2	43·4	41·7	122·4	47·4
	Died ..	..	·56	·54	·65	·76	·38	·91
Constitutional—								
Rheumatism ..	Admitted ..	37·5	39·5	48·5	30·6	35·2	61·1	56·7
	Died	..	·09	..	..	·02	·38	..
Syphilis ..	Admitted ..	71·7	110·0	93·8	210·2	76·4	75·0	81·9
	Died	..	..	·15	..	·09	..	..
Scrofula, Phthisis, &c.	Admitted ..	11·6	11·0	11·4	12·9	11·1	13·8	18·6
	Died	1·67	1·52	1·70	2·91	2·52	1·14	3·12
Scurvy and Purpura.. ..	Admitted ..	..	·2	·4	·2	·1	..	·3
	Died	..	..	..	..	..	..	..
Anæmia ..	Admitted ..	·8	1·4	·7	1·9	1·5	..	3·4
	Died	..	..	..	..	·02	..	..
Other Constitutional Diseases	Admitted ..	1·7	1·0	1·1	·8	·6	1·2	1·3
	Died	..	..	·08	..	·09	..	·26
Total of Constitutional Group..	Admitted	123·3	160·7	155·9	256·6	124·9	151·1	162·2
	Died ..	1·7	1·61	1·93	2·91	2·74	1·52	3·38

Eruptive Fevers were much less prevalent than in 1871 in all the arms, except the Depôt Brigade Royal Artillery, and the Depôts. In the former there was a considerable increase on the high ratio of the preceding year, but the excess was due entirely to the admission of 45 cases of vaccination, the other admissions having been only three for measles, and one for small-pox. At the Depôts, in addition to nine admissions for vaccination, there were 24 for measles, extending over 13 Depôts; 18 for small-pox, extending over 11; and 10 for scarlet fever, extending over 8. In the Foot Guards, the ratio of admissions fell from 13·2 per 1 000 of the strength, the ratio for 1871, to 2·7, the reduction being due chiefly to the cessation of the epidemic of small-pox which prevailed during the former year. None of the battalions of Guards had more than two admissions for any one of the eruptive fevers. The Infantry Regiments suffered less from small-pox than in 1871. There were five cases in the 4th Battalion of the 60th Rifles, four in the 2nd Battalion of the 5th, and the 1st of the 16th, respectively, and three in each of the following Battalions—1st of the 15th, 1st of the 20th, the 91st, and 93rd. Scarlet fever,

United Kingdom.

also, was reduced in prevalence in the Infantry. There were four admissions for it in the 93rd Highlanders in Edinburgh, and three in the 100th Regiment at Aldershot, but the number did not exceed two in any other corps in the United Kingdom. The prevalence of measles, as has been mentioned, was greater than in 1871, but no particular corps suffered from it to a serious extent. There were nine cases in the 79th Regiment, eight in the 1st Battalion of the 25th, seven in each of the following regiments—2nd Battalion 6th, 84th, 104th, and 4th Battalion Rifle Brigade, and six in the 102nd. The number did not exceed five in any other battalion.

Continued Fevers.—The ratio of admissions for continued fevers was higher than that for 1871 in the Household Cavalry, the Royal Artillery, and the Depôts, and lower in the Cavalry of the Line, the Foot Guards, the Infantry Regiments, and the Depôt Brigade Royal Artillery. The ratio was highest in the Guards and Royal Artillery, and after them in the Depôt Brigade Royal Artillery and the Depôts. It was lowest in the Household Cavalry. The diseases returned under this head included six cases of typhus fever with two deaths, one case of relapsing fever, 83 of enteric fever with 22 deaths, 612 of simple continued fever with 8 deaths, and 1,018 of febricula. One case of typhus fever occurred in each of the following Battalions—1st of the Coldstream Guards in London, 2nd of the 5th Regiment, and 1st of the 15th in Dublin, 2nd of the 13th at Clonmel, 1st of the 25th at Birr, and the Depôt of the 36th at Pembroke Dock. The fatal cases were those at Clonmel and Birr. The case of relapsing fever occurred in the 2nd Dragoons at Edinburgh. The number of cases of enteric fever reported is almost the same, and the number of deaths is exactly the same as in 1871, but from the figures on page it is obvious that a considerable number of the slighter cases must have been returned under other heads, and it appears from the Report on the 2nd Battalion of the 13th Regiment, that a fatal case in that corps at Dublin, returned under simple continued fever, was in reality one of enteric fever. This disease, however, though widely spread and affecting a large number of stations, was nowhere the cause of many admissions to hospital or of much mortality. The ratio of admissions for it was highest in the Artillery, but in the 11th Brigade, in which they were most numerous, they only amounted to six, the average strength being 1471. In the 1st Brigade they were five, and in the 12th Brigade four. In the 2nd Battalion of the Coldstream Guards and the 1st of the 25th Regiment respectively, there were four admissions, these being the corps in which the ratio was highest. The deaths did not exceed two in any Regiment or Brigade of Artillery.

Simple Continued Fever caused a higher ratio of admissions in the Foot Guards than in any of the other arms, the three Battalions of the Grenadier Guards being those in which it was highest. Febricula, on the other hand, caused fewer admissions in the Guards than in any of the other arms except the Household Cavalry. As most of the cases which, while the old nomenclature of diseases was in use, were returned under "ebriositas," are now returned under this head and, that of dyspepsia, the ratio of admissions for these diseases per 1,000 of the strength in the several arms may be mentioned here :—

	Ratio of Admissions per 1,000 of the Strength in						
	Household Cavalry.	Cavalry of the Line.	Royal Artillery.	Foot Guards.	Infantry Regiments.	Depôt Brigade R.A.	Depôts.
Febricula ..	5·83	10·25	14·90	7·28	10·35	12·62	13·14
Dyspepsia ..	35·00	18·32	24·32	20·38	18·40	45·14	26·15

Paroxysmal Fevers were less prevalent in all the arms except the Household Cavalry (in which there were no cases either in 1871 or in 1872), the Infantry

Regiments, and the Depôt Brigade Royal Artillery. Their prevalence was greatest in the Depôt Brigade Royal Artillery, and, after it, in the Royal Artillery. In the 1st Division of the Depôt Brigade stationed at Sheerness, the admissions were more than twice as numerous as in the 2nd Division stationed at Woolwich, although the strength of the former was not quite half that of the latter. The ratio per 1,000 of the strength at Sheerness was 136, which is nearly eight times that in any of the other arms. The medical officer in charge, in bringing to notice the great prevalence of malarious diseases at that station, observes with truth that service there must be a bad preparation for tropical service. The Brigade of Artillery and the Regiments of Infantry in which the admissions were most numerous were the 22nd Brigade Royal Artillery, and the 1st Battalion of the 19th, the 38th, 79th, and 104th Regiments, all of which returned from India either in the end of 1871 or in the begining of 1872, bringing with them a tendency to relapses of paroxysmal fevers on exposure to any depressing cause, the result of exposure to malaria there. *United Kingdom.*

Influenza was considerably less prevalent in all the arms except the Foot Guards, in which there was a slight increase, most marked in the 1st Battalion of the Coldstream Guards; that being, however, it may be observed, the Battalion in which the ratio of admissions for bronchitis was lowest.

Rheumatism was less prevalent in all the arms except the Cavalry of the Line, and the Depôts. in each of which there was a slight increase. It was most prevalent in the Depôt Brigade Royal Artillery, in which, however, the reduction on the ratio for 1871 was greatest; and, after it, in the Depôts, and the Royal Artillery. In the other arms the ratio was lower than usual.

Syphilis.—The increase which has been noted in the ratio of admissions in the force in the United Kingdom showed itself in all the arms except the Household Cavalry, the Royal Artillery, and the Depôt Brigade Royal Artillery. In the Cavalry of the Line and the Foot Guards, respectively, it amounted to 20 and 60·1 per 1,000 of the strength. The ratio in the Foot Guards, which was greatly the highest, was nearly double that in the Cavalry of the Line, and nearly three times that in the Household Cavalry, the Infantry Regiments, or the Depôt Brigade Royal Artillery. The Battalions in which it was highest were the 1st and 3rd of the Grenadier Guards. and the 1st of the Coldstream Guards. The Cavalry of the Line came next to the Guards in the order of prevalence of syphilitic diseases. In that arm the ratio of admissions was highest in the 1st Dragoons, in which it amounted to 237 per 1,000 of the strength, but it was very high in the 13th Hussars also. In the Artillery which followed the Cavalry of the Line in the order of prevalence, the Brigade in which the ratio was highest were the C Brigade Royal Horse Artillery, and the 4th, 11th, and 14th Brigades Royal Artillery. The Infantry Regiments in which syphilitic diseases were most prevalent were as follows, the order in which they are arranged being that of the prevalence of these diseases:—1st Battalion 16th, 1st Battalion 20th, 2nd Battalion 14th, 79th, 4th Battalion Rifle Brigade, 1st Battalion 15th.

Scrofula, Phthisis, &c.—The ratio of admissions for these diseases was higher in all the arms except the Infantry Regiments, in which it was exactly the same as in 1871, but that of mortality from them was lower in all except the Foot Guards, the Depôts, and the Infantry Regiments. In the last the increase was very trifling. The amount of invaliding exceeded that in 1871 in all the arms except the Royal Artillery and the Infantry Regiments. The following Table shows the total loss by death and invaliding from these diseases:—

United Kingdom.

	Loss per 1,000 by			
	Death.	Invaliding.	Death and Invaliding.	
			1872.	1871.
Household Cavalry	1·70	6·67	8·37	7·47
Cavalry of Line	1·52	5·32	6·84	3·82
Royal Artillery	1·70	5·09	6·79	7·84
Foot Guards..	2·91	5·66	8·57	6·11
Infantry Regiments..	2·52	4·15	6·67	6·77
Depôt Brigade, Royal Artillery ..	1·14	6·12	7·26	7·89

In the Household Cavalry, the Cavalry of the Line, and the Foot Guards, the loss was greater, and in the Royal Artillery, the Infantry Regiments, and the Depôt Brigade Royal Artillery, it was less than during the preceding year,

LOCAL DISEASES—The admissions for *diseases of the nervous system* were in a higher ratio than during the preceding year, in the Household Cavalry, the Depôt Brigade Royal Artillery, and the Depôts, and in a lower in all the other arms. The death rate from them was lower in all except the Depôts, the Royal Artillery, Coast Brigade Royal Artillery, and the Army Service Corps. The proportion of invaliding was higher in the Royal Artillery, the Foot Guards, the Infantry Regiments, the Depôt Brigade Royal Artillery, the Depôts, the Coast Brigade Royal Artillery, and the Army Service Corps, and lower in the Household Cavalry, the Cavalry of the Line, the Royal Engineers, and the Army Hospital Corps. The ratio of admissions was highest in the Depôts, and the Depôt Brigade Royal Artillery, and, after them, in the Household Cavalry. It was lowest in the Cavalry of the Line. That of deaths was highest in the Coast Brigade Royal Artillery, and, after it, in the Depôts. The proportion invalided was highest in the Depôts, in which it was more than double that in any other arm, and, after them, in the Royal Artillery and the Army Hospital Corps. Epilepsy, neuralgia, and paralysis caused the greater part of the admissions under this order, and the first and last of these diseases caused the greater part of the invaliding from it. The numbers invalided for epilepsy were in the following proportions per 1,000 of the strength in the several arms:—Household Cavalry 0, Cavalry of the Line ·42, Royal Artillery 2·47, Foot Guards ·65, Infantry Regiments 1·17, Depôt Brigade Royal Artillery 2·68, Depôts 4·81. Mental diseases were rather more prevalent in the Depôt Brigade Royal Artillery and the Depôts, and less so in all the other arms. The ratio per 1,000 of the strength of the admissions and invaliding from them in the several arms were as follows :—

	Household Cavalry.	Cavalry of the Line.	Royal Artillery.	Foot Guards.	Infantry Regiments.	Depôt Brigade R.A.	Depôts.
Admissions for Mental Diseases.	1·67	1·33	1·70	·81	1·32	4·97	3·25
Invalided for Mental Diseases..	·83	·57	·62	·81	·81	·38	1·69

Diseases of the Circulatory System caused a higher ratio of admissions in all the arms except the Household Cavalry, and an increased amount of invaliding in all except the Coast Brigade Royal Artillery, the Army Hospital Corps, and the Army Service Corps. In the last two and the Depôt Brigade Royal Artillery and Depôts, the mortality from them also was increased; but in the Household Cavalry, the Cavalry of the Line, the Royal Artillery, the Foot Guards, the Infantry Regiments, and the Coast Brigade Royal Artillery, there was an important reduction of mortality. The relative prevalence of the more important diseases of this order in the several arms, and the mortality and invaliding from them in each, are shown in the following Table :—

United Kingdom.

Annual Ratio per 1,000 of the Strength in

	Household Cavalry.			Cavalry of the Line.			Royal Artillery.			Foot Guards.			Infantry Regiments.			Depôt Brigade, R. A.			Depôts.		
	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.
Organic Diseases of Heart ..	·33	..	1·67	4·75	·47	2·28	6·95	1·16	3·01	4·37	·65	3·56	4·94	·42	2·45	7·65	..	3·82	9·63	·52	5·34
Functional „ ..	..	..	..	3·61	..	·95	9·26	..	2·78	1·46	..	·32	6·17	..	1·21	13·77	·38	2·68	8·06	·26	2·99
Aneurism	..	..	..	·66	·47	·28	1·08	·69	·54	·32	·48	·16	·79	·49	·34	1·91	1·15	·76	2·21	1·43	·91
Varicose Veins	..	..	..	1·23	..	1·42	1·16	..	·89	1·61	..	·16	1·21	..	·79	..	..	..	2·47	..	1·43

United Kingdom.

Diseases of the Respiratory System were more prevalent than in 1871 in the Depôts, and, to a slight extent, also, in the Cavalry of the Line. In the Household Cavalry there was no change; and in all the other arms there was a large reduction. The proportion of deaths from them was increased in the Depôts, unchanged in the Household Cavalry, the Foot Guards, and the Infantry, and reduced in the Cavalry, the Royal Artillery, and the Depôt Brigade Royal Artillery. That of invaliding was the same in the Household Cavalry, reduced in the Cavalry of the Line and the Foot Guards, and higher in all the other arms. The prevalence of these diseases was greatest in the Depôts, the Depôt Brigade Royal Artillery, and the Royal Artillery, and the mortality from them in the Coast Brigade Royal Artillery, the Depôts, and the Foot Guards. Bronchitis was greatly the most prevalent disease of the order, and pneumonia greatly the most fatal. The admissions from the former, and the deaths from the latter, were in the following proportions per 1,000 of the strength in the several arms:—

	Ratio per 1,000 of the Strength.						
	Household Cavalry.	Cavalry of the Line.	Royal Artillery.	Foot Guards.	Infantry Regiments.	Depôt Brigade R.A.	Depôts.
Admissions from Bronchitis ..	75·83	56·02	81·50	41·90	59·98	86·46	85·86
Deaths from Pneumonia ..	..	·47	·54	·97	·79	1·15	1·43

Diseases of the Digestive System caused the same proportion of admissions as in 1871, in the Household Cavalry, an increased proportion in the Cavalry of the Line, the Foot Guards, and the Depôts, and a lower one in the Royal Artillery, the Infantry Regiments, and the Depôt Brigade Royal Artillery. There were no deaths and no men invalided from them in the Household Cavalry. The death rate was lower in the Cavalry, and the Royal Artillery, but higher in all the other arms. The proportion invalided was the same in the Foot Guards, lower in the Royal Artillery, and higher in the other arms. The most prevalent diseases of this order were sore throat and tonsillitis, dyspepsia, and diarrhœa. The most fatal were hepatitis, including hepatic abcess, and dysentery. From the former there were 17 deaths, from the latter five. The majority of the fatal attacks were relapses of disease contracted on tropical service. In the Household Cavalry and the Foot Guards, which are exempt from such service, there were no admissions for dysentery, and but seven for hepatitis.

Diseases of the Urinary System caused fewer admissions in proportion to the strength than during the preceding year in the Royal Artillery, and the Infantry Regiments; almost the same proportion in the Household Cavalry; and a higher one in all the other arms. The proportion was highest in the Depôt Brigade Royal Artillery, and lowest in the Household Cavalry. Its fluctuations are for the most part the result of changes in the prevalence of gonorrhœa, which always occasions the great majority of the admissions under this order. In the prevalence of Bright's Disease, which, as has been already stated, causes most of the deaths recorded from it, there is seldom much change. The admissions from gonorrhœa and its sequelæ, phimosis, bubo, epididymitis, gonorrhœal condyloma, and stricture of the urethra, were in the following proportions per 1,000 of the strength in the several arms:—

	Household Cavalry.	Cavalry of the Line.	Royal Artillery.	Foot Guards.	Infantry Regiments.	Depôt Brigade R.A.	Depôts.
Ratio per 1,000 of Strength of admissions for Gonorrhœa, and its sequelæ ..	49·17	101·59	145·86	81·54	97·64	192·80	117·86

Diseases of the Cutaneous System.—The admissions from diseases of this order were in a higher ratio than in 1871 in the Household Cavalry and the Depôts, and in a lower ratio in all the other arms. The increase in the Household Cavalry took place chiefly in boils and ulcers, that in the Depôts in itch and ulcers.

INJURIES.—*Accidental injuries* caused a higher proportion of admissions than in 1871 in the Depôts, almost the same proportion in the Cavalry and Artillery, and a smaller proportion in all the other arms. The ratio was highest in the Royal Artillery, and, after it, in the Cavalry, the Depôt Brigade Royal Artillery, and the Household Cavalry, and lowest in the Foot Guards and the Infantry Regiments. The excess in the Artillery and the mounted arms is constant, and results from the nature of their duties. In comparing the ratios of admissions into hospital and constantly sick in the different arms it is important that this should be borne in mind.

The proportion of deaths by suicide, per 1,000 of the strength, in the several arms, is shown in the Table on page 16. The general ratio, as has been stated, was lower than that for either of the two preceding years; but, from the smallness of the numbers, no reliable conclusions as to the comparative prevalence of suicide in the several arms can be based on the statistics of a single year. In further illustration of this subject, and for the purpose of comparison, the table which follows, in which are included the statistics of suicide in the army at home for the ten years from 1862 to 1871, has been framed:—

	Deaths by Suicide during the 10 years 1862-1871.	
	Number.	Ratio per 1,000 of Strength.
Household Cavalry	2	·164
Cavalry of the Line, including Military Train.	51	·498
Royal Artillery, including Depôt and Coast Brigades	48	·343
Royal Engineers..	5	·178
Foot Guards	11	·209
Infantry, including Depôt Battalions.. ..	134	·309
Army Hospital Corps, Army Service Corps, Commissariat Staff Corps, Army Schoolmasters	8	·864
Troops in United Kingdom	259	·332

The comparatively high ratio in the last group of corps was the result of the greater prevalence of suicide by poisoning in the Army Hospital Corps than in any of the other arms during the period. Of eight deaths by suicide in that group six were in the Army Hospital Corps, and four of them by poisoning. Future statistics will show whether that preponderance was

United Kingdom.

accidental or the result of the greater familiarity with poisonous drugs possessed by men of the Army Hospital Corps, and the more ready access to them involved by the nature of their duties.

The following Table shows the sickness, mortality, and invaliding, in each corps serving at home during the whole year :—

Regiments, &c.	Average Annual Strength.	Admitted into Hospital.	Died.			Invalided.	Annual Ratio per 1,000.			Stations.	Months.
			In Hospital.	Out of Hospital.	Total.		Admitted.	Died.	Invalided.		
1st Life Gds.	395	234	1	1	2	9	592·4	5·06	22·78	Windsor ..	3
										A. M.* ..	1
										London ..	8
2nd „	406	230	..	..	..	6	566·5	..	14·78	London ..	11
										A. M.* ..	1
R. Horse Gds.	399	288	..	1	1	2	721·8	2·51	5·01	London ..	3
										A. M.* ..	1
										Windsor ..	8
Total Household Cavalry	1,200	752	1	2	3	17	626·7	2·50	14·16		
1st Dn. Gds.	498	282	2	1	3	10	566·3	6·02	20·08	Dublin ..	12
2nd „	512	392	3	..	3	9	765·6	5·86	17·58	Aldershot ..	7½
										A. M.* ..	1
										Brighton ..	3½
3rd „	513	478	6	1	7	20	931·8	13·65	39·08	Shorncliffe & Maidstone	11
										A. M.* ..	1
										Manchester & Liverpool	4½
										Curragh ..	1
4th „	593	298	1	1	2	23	502·5	3·37	38·78	Dundalk, with det. at Belfast and Belturbet	6½
5th „	580	550	3	..	3	7	948·3	5·17	12·07	York, with det.	7⅔
										Manchester, with dets.	4⅓
6th „	517	479	3	1	4	21	926·5	7·74	40·62	Dublin ..	4⅓
										A. M.* ..	1
										Aldershot ..	6⅔
7th „	497	404	2	1	3	10	812·9	6·04	20·12	Norwich and Ipswich	12
1st Dragoons	615	457	3	..	3	12	743·1	4·88	19·51	Dundalk, with det.	4½
										Dublin ..	7½
2nd „	587	673	3	..	3	18	1146·5	5·11	30·66	Edinburgh ..	12
6th „	503	337	..	1	1	9	670·0	1·99	17·89	Cahir, with det.	12
7th Hussars	516	443	2	..	2	18	858·5	3·87	34·88	Aldershot ..	6½
										A. M.* ..	1
										Hounslow ..	4½
8th „	505	376	2	1	3	13	744·5	5·94	25·74	Curragh and Newbridge	10
										Longford ..	2
9th Lancers	603	487	1	..	1	21	807·6	1·66	34·82	Aldershot ..	4½
										Woolwich ..	3
										A. M.* ..	1½
										York ..	3

* The letters "A. M." indicate that the Corps, or a portion of it, took part in the Autumn Manœuvres.

Regiments, &c.	Average Annual Strength.	Admitted into Hospital.	Died. In Hospital.	Died. Out of Hospital.	Died. Total.	Invalided.	Annual Ratio per 1,000. Admitted.	Annual Ratio per 1,000. Died.	Annual Ratio per 1,000. Invalided.	Stations. Months.
10th Hussars	617	410	4	..	4	21	663·0	6·48	34·03	Colchester .. 10 A. M.* .. 2
12th Lancers	603	433	4	1	5	9	718·1	8·29	14·96	Hounslow .. 7½ A. M.* .. 1½ Leeds, with det. 3
13th Hussars	611	578	5	2	7	9	946·0	11·46	14·73	Leeds, with det. 5½ A. M.* .. 1 Aldershot .. 5½
14th „	616	327	..	..	..	29	530·8	..	47·08	Ballincollig, with det. 4½ Newbridge .. 7½
17th Lancers	506	385	3	1	4	18	760·9	7·90	35·57	Longford, with det. 4 Ballincollig, with det. 8
19th Hussars	501	370	2	1	3	34	738·5	5·99	67·86	Brighton .. 7½ A. M.* .. 1 Aldershot .. 3½
Riding Establishment ..	39	23	..	..	..	..	589·7	..	..	Canterbury.
Total Cavalry of Line	10,532	8,182	49	12	61	311	776·9	5·79	29·53	
Rl. Artillery:										
B Brigade R.H.A.	1,216	1,017	5	..	5	36	836·3	4·11	29·60	A: A. M.*.. 1, Christch. 11 B: Dorchester 7½, A. M.*.. 1½, Dublin 3 C. Canterbury 12 D: Aldershot 7½, A. M.*.. 1½, Dublin.. 3 E: Aldershot 7½, A. M.* 1, Coventry 3½ F & G: Woolwich 8½, Aldershot 3½ H.. Birmingham.. 12
C Brigade R.H.A.	1,219	1,054	11	3	14	38	864·6	11·48	31·17	A.. Woolwich 12 B & C: Ireland 8, Woolwich 4 D.. Exeter 12 E: Coventry 7, A. M.*.. 1, Aldershot 1, Woolwich 3 F .. Exeter 12 G: Woolwich 4½, A. M.*.. 1, Aldershot 3, Dorchester 3½ H.. Ireland.. 12

United Kingdom.

Regiments, &c.	Average Annual Strength.	Admitted into Hospital.	Died. In Hospital.	Died. Out of Hospital.	Died. Total.	Invalided.	Annual Ratio per 1,000. Admitted.	Annual Ratio per 1,000. Died	Annual Ratio per 1,000. Invalided.	Stations. Months.
Riding Establishment	238	146	1	..	1	3	613·4	4·20	12·61	Woolwich 12
1st Brig. R.A.	1,473	1,640	9	1	10	78	1113·3	6·79	52·95	A .. Woolwich 12 B .. Shorncliffe 12 C { Woolwich 10⅔ A. M.*.. 1⅓ D { Hilsea .. 10⅔ A. M.*.. 1⅓ E { Woolwich 7⅔ Aldershot 3⅓ A. M.*.. 1 F { Sheerness 11 A. M.*.. 1 G . Shorncliffe 12 H&K. Weedon 12 I .. Woolwich 12
4th „	1,484	1,340	3	2	5	50	903·0	3·37	33·69	A .. Dublin 12 B .. Kilkenny 12 C .. Fermoy 12 D .. Athlone 12 E { Curragh 8½ Limerick 3½ F { Limerick 6 Curragh 6 G .. Clonmel 12 H .. Ipswich 12 I . Ballincollig 12 K .. Bristol 12
7th „	763	893	4	1	5	33	1170·3	6·55	43·25	No. 1— Portsmouth 12 No. 2— Weymouth 10⅔ Portsmouth 1⅓ Nos. 3, 4, 5 & 6— Portsmouth & Gosport 12 No. 7— Isle of Wight 9 Portsmouth 3
11th „	1,471	1,565	10	5	15	33	1063·9	10·20	22·43	A .. Northampton .. 12 B { Hilsea & Exeter 12 C .. Sheffield 12 D Trowbridge 12 E { Newport, wth det. at Brecon .. 12 F { Chichester 4⅔ Aldershot 7⅓ G Portsmouth 12 H { Aldershot 4⅓ Chichester 7⅓ I .. Sheffield 12 K .. Devonport 12
12th „	1,027	660	9	3	12	39	642·6	11·68	37·97	Pembroke Dock and Devonport 12

United Kingdom.

Regiments, &c.	Average Annual Strength.	Admitted into Hospital.	Died. In Hospital.	Died. Out of Hospital.	Died. Total.	Invalided.	Annual Ratio per 1,000. Admitted.	Annual Ratio per 1,000. Died.	Annual Ratio per 1,000. Invalided.	Stations. Months.
14th Brigade	1,464	1,330	8	2	10	46	908·5	6·83	31·42	A, B, C, E, & H—Aldershot .. 11 A, B, C, & H—A. M.* .. 1 D, I, & K—Newcastle 12 F .. Leith Fort 12 G .. Preston .. 12
17th „	992	611	9	2	11	23	615·9	11·09	23·18	Nos. 1,3,4 & 5—Dover 12 with det. at Newhaven & Harwich. No. 2—Shoeburyness 12 Nos. 6 & 7—Cork and Limerick .. 12
21st „	862	606	2	1	3	12	703·0	3·48	13·92	Nos. 1 & 2—Channel Islands 12 No. 3—Wlwich & Portsmouth 12 No. 4. Ireland 12 No. 5—Gravesend .. 9, Portsmouth 3 No. 6—Shoeburyness 9, Portsmouth 3 No. 7—Woolwich 9, I. of Wight 3
22nd „	748	1,192	7	1	8	13	1593·5	10·69	17·38	Woolwich .. 12 with dets. at Purfleet, Shoeburyness, and Gravesend.
Total Royal Artillery	12,957	12,054	78	21	99	404	930·3	7·64	31·19	
Foot Guards:										
Gren. Gds., 1st Bn. ..	882	732	6	1	7	17	829·9	7·94	19·27	London .. 11
2nd Bn. ..	882	602	3	..	3	14	682·5	3·40	15·87	Dublin .. 3 London .. 5½ Windsor .. 3½
3rd Bn. ..	874	799	4	2	6	26	914·2	6·86	29·75	London .. 11 A. M.* .. 1
Coldm. Gds., 1st Bn. ..	878	688	4	2	6	18	783·6	6·83	20·50	London .. 11 A. M.* .. 1
2nd Bn. ..	905	475	6	..	6	15	524·9	6·63	16·57	Windsor .. 3 Dublin .. 7 Curragh .. 2

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Regiments, &c.	Average Annual Strength.	Admitted into Hospital.	Died.			Invalided.	Annual Ratio per 1,000.			Stations.	
			In Hospital.	Out of Hospital.	Total.		Admitted.	Died.	Invalided.		Months.
oots F. Gds.,											
1st Bn. ..	880	541	8	2	10	19	614·8	11·36	21·59	London ..	7
										Windsor ..	4
										A. M.* ..	1
2nd Bn. ..	880	556	9	2	11	19	631·8	12·50	21·59	London ..	12
Total Foot Guards	6,181	4,393	40	9	49	128	710·7	7·92	20·71		
1st Foot, 1st Bn.	596	458	5	2	7	30	768·4	11·74	50·33	Warley ..	8⅔
										(With detach. at Windsor 1 month)	
										Aldershot ..	3⅓
2nd Foot, 2nd Bn.	695	506	..	1	1	6	728·0	1·44	8·63	Fort Tregantle	6
										Devonport ..	6
3rd Foot, 2nd Bn.	703	341	5	3	8	17	485·7	11·40	24·22	Dover ..	12
4th Foot, 1st Bn.	848	415	1	..	1	25	489·4	1·18	29·48	Portsmouth	12
4th Foot, 2nd Bn.	620	438	2	..	2	17	706·4	3·23	27·42	Aldershot ..	7⅔
										A. M.* ..	1
										Woolwich ..	3⅓
5th Foot, 2nd Bn.	614	329	3	2	5	13	535·8	8·14	21·17	Dublin ..	2⅔
										Curragh ..	6⅓
										Kilkenny, with dets.	3
6th Foot, 2nd Bn.	619	305	1	..	1	7	492·7	1·62	11·31	Buttevant, with dets.	1
										Curragh, with det. at Birr ..	11
7th Foot, 1st Bn.	606	394	8	1	9	14	650·2	14·85	23·10	Portsmouth..	7⅔
										A. M.* ..	1
										Aldershot ..	3⅓
7th Foot, 2nd Bn.	903	595	4	..	4	21	658·9	4·43	12·18	Curragh ..	⅓
										Fermoy, with det.	6
										Cork, with det.	5⅓
8th Foot, 2nd Bn.	604	450	4	..	4	11	745·0	6·62	18·21	Manchester..	6⅓
										Preston ..	5⅓
9th Foot, 1st Bn.	620	423	5	2	7	21	682·2	11·29	33·87	Cork, with det.	6⅔
										Guernsey & Alderney	5
9th Foot, 2nd Bn.	825	594	5	1	6	72	720·0	7·27	87·27	Shorncliffe, with det. at Chatham	12
11th Foot, 2nd Bn.	720	434	4	..	4	10	602·8	5·56	13·89	Curragh ..	6⅓
										Glasgow, with det.	5⅓
12th Foot, 1st Bn.	774	498	5	..	5	5	643·4	6·46	6·46	Preston ..	6⅓
										Athlone, with det.	5⅓
13th Foot, 2nd Bn.	730	531	6	..	6	17	727·4	8·22	23·29	Kilkenny, with det.	6
										Dublin, with det. ..	6

United Kingdom.

Regiments, &c.	Average Annual Strength.	Admitted into Hospital.	Died. In Hospital.	Died. Out of Hospital.	Died. Total.	Invalided.	Annual Ratio per 1,000. Admitted.	Annual Ratio per 1,000. Died.	Annual Ratio per 1,000. Invalided.	Stations.	Months.
14th Foot 2nd Bn.	584	598	1	..	1	5	1023·9	1·71	8·56	Chester, with det. at Bradford & Liverpool ..	12
15th Foot, 1st Bn.	640	519	2	..	2	14	810·9	3·12	21·87	Curragh ..	2⅔
										Dublin ..	6½
										Cork ..	3
15th Foot, 2nd Bn.	834	440	2	1	3	16	527·6	3·60	19·18	Aldershot ..	8
										A. M.* ..	1½
										Portsmouth ..	2½
16th Foot, 1st Bn.	628	545	..	1	1	5	867·8	1·59	7·96	Dublin ..	6
										Jersey ..	6
16th Foot 2nd Bn.	803	571	2	1	3	22	711·1	3·74	27·40	Colchester ..	7⅓
										A. M.* ..	1⅓
										Aldershot ..	3⅓
17th Foot, 2nd Bn.	597	384	2	2	4	8	643·2	6·70	13·40	Aldershot ..	7
										A. M.* ..	1½
										Plymouth ..	3½
18th Foot, 2nd Bn.	614	504	5	..	5	10	820·8	8·14	16·29	Devonport ..	6
										Aldershot ..	6
19th Foot, 1st Bn.	605	589	13	1	14	12	973·5	23·14	19·83	Gosport and Gosport Fts.	12
20th Foot, 1st Bn.	839	490	9	..	9	12	584·0	10·73	14·30	Dublin, with det. ..	7⅔
										Belfast ..	⅓
										Newry ..	4
22nd Foot, 1st Bn.	616	372	2	..	2	3	603·9	3·25	4·87	Guernsey & Alderney	7
										A. M.* ..	1½
										Aldershot ..	3½
22nd Foot, 2nd Bn.	875	566	6	..	6	9	646·8	6·86	10·28	Aldershot ..	7
										A. M.* ..	1
										Fermoy, with det. at Mitchelstown	4
23rd Foot, 1st Bn.	621	335	8	1	9	15	539·4	14·49	24·15	Pembroke Dock	12
23rd Foot, 2nd Bn.	874	434	2	3	5	4	496·6	5·72	4·58	Woolwich ..	7½
										A. M.* ..	1
										Mullingar, with det.	3½
25th Foot, 1st Bn.	776	489	7	..	7	17	630·1	9·02	21·91	Birr, with det. ..	6½
										Curragh ..	5½
27th Foot ..	871	684	16	2	18	33	785·3	20·66	37·89	Aldershot ..	8
										A. M.* ..	1
										Gosport ..	3
30th „ ..	679	590	6	..	6	16	868·9	8·84	23·56	Jersey ..	6½
										A. M.* ..	1
										Aldershot ..	4½
33rd „ ..	680	628	1	1	2	33	923·5	2·94	48·53	Colchester ..	12
34th „ ..	876	519	5	1	6	20	592·5	6·85	22·83	Newry, with det.	6
										Curragh ..	6

United Kingdom.

Regiments, &c.	Average Annual Strength.	Admitted into Hospital.	Died. In Hospital.	Died. Out of Hospital.	Died. Total.	Invalided.	Annual Ratio per 1,000. Admitted.	Annual Ratio per 1,000. Died.	Annual Ratio per 1,000. Invalided.	Stations.	Months.
35th Foot ..	729	524	3	4	7	18	718·8	9·60	24·69	Sheffield, with det. at Tynemouth & Sunderland	12
38th „ ..	639	738	6	..	6	69	1154·9	9·39	108·08	Dover ..	12
42nd „ ..	702	460	1	..	1	11	569·8	1·42	15·67	Devonport ..	12
46th „ ..	706	489	9	..	9	25	692·6	12·75	35·41	Aldershot ..	11
										A. M.* ..	1
47th „ ..	647	402	..	..	..	10	621·3	..	15·45	Fleetwood & Carlisle	12
50th „ ..	655	381	7	..	7	27	581·7	10·69	41·22	Aldershot ..	7½
										A. M.* ..	1
										Colchester ..	3½
57th „ ..	875	410	4	3	7	13	468·6	8·00	14·86	Limerick, with det.	3
										Kinsale, with det.	9
60th Foot 4th Bn.	696	369	4	3	7	7	530·2	10·06	10·06	Winchester	11
										A. M.* ..	1
77th Foot ..	630	354	2	2	4	10	561·9	6·35	15·87	Portland, with det. at Weymouth	12
78th „ ..	487	286	3	..	3	6	587·3	6·16	12·32	Belfast, with det. at Londonderry & Carrickfergus	12
79th „ ..	627	668	6	2	8	24	1065·3	12·76	38·28	Isle of Wight	12
82nd „ ..	607	333	7	1	8	7	548·6	13·18	11·53	Aldershot ..	8⅔
										Chatham ..	3⅓
84th „ ..	589	248	2	..	2	8	421·0	3·40	13·58	Fermoy, with det. at Cork ..	4½
										Curragh, with det. at Naas ..	7½
88th „ ..	611	360	5	..	5	9	589·2	8·19	14·73	Portsmouth..	7⅓
										A. M.* ..	1⅔
										Aldershot ..	3⅓
90th „ ..	647	414	7	1	8	15	639·9	12·36	23·18	Glasgow, with det. at Ayr and Stirling	6⅔
										A. M.* ..	1
										Aldershot ..	4⅓
91st „ ..	570	174	3	2	5	10	305·3	8·77	17·54	Fort George, with det. at Aberdeen	12
93rd „ ..	612	592	6	..	6	17	967·3	9·80	27·78	Edinburgh, with det. at Dundee and Greenlaw	12
94th „ ..	721	573	7	1	8	..	794·7	11·09	..	Newport, with det.	12
										Gosport ..	7
95th „ ..	602	490	3	1	4	21	813·9	6·64	34·88	A. M.* ..	1⅓
										Aldershot ..	3⅔

Regiments, &c.	Average Annual Strength.	Admitted into Hospital.	Died. In Hospital.	Died. Out of Hospital.	Died. Total.	Invalided.	Annual Ratio per 1,000. Admitted.	Annual Ratio per 1,000. Died.	Annual Ratio per 1,000. Invalided.	Stations. Months
97th Foot ..	886	686	1	..	1	19	774·3	1·13	21·44	Mullingar, with det. 4½; Curragh .. 3; Dublin .. 4½
98th „ ..	842	408	2	1	3	8	484·6	3·56	9·50	Templemore, with det. 12
99th „ ..	652	478	5	1	6	7	733·1	9·20	10·74	Aldershot .. 8; A. M.* .. ½; Shorncliffe .. 3½
100th „ ..	641	444	5	..	5	3	692·7	7·80	4·68	Aldershot .. 8; A. M.* .. ⅔; Portsmouth 3⅓
101st „ ..	704	499	2	..	2	7	708·8	2·84	9·94	Bury, with detachment 6½; Manchester, with det. 5½
102nd „ ..	611	304	6	..	6	14	497·5	9·82	22·91	Aldershot .. 8; A. M.* .. ½; Isle of Wight 3½
103rd „ ..	610	479	..	1	1	24	785·2	1·64	39·34	Isle of Wight 6; Aldershot .. 6
104th „ ..	590	424	5	2	7	18	718·6	11·86	30·51	Portsmouth and Gosport 12
Rifle Brig., 1st Bn.	678	263	1	..	1	25	387·9	1·47	36·87	Dover .. 12
Rifle Brig., 2nd Bn.	920	378	8	1	9	30	410·9	9·78	32·61	Shorncliffe .. 7½; A. M.* .. 1; Birr, with detachment 3½
Rifle Brig., 3rd Bn.	673	699	8	3	11	46	1038·6	16·34	68·35	Portsmouth 12
Rifle Brig., 4th Bn.	903	611	6	..	6	19	676·6	6·64	21·04	Chatham .. 7½; A. M.* .. 1; Dublin .. 3½
Total Infantry Regiments	44,551	29,846	281	55	336	1,057	669·9	7·54	23·72	
Depôt Brig. Royal Art.— 1st Division..	853	821	3	5	8	20	962·5	9·38	23·45	Sheerness, with det. at Fort Grain 12
2nd „ ..	1,761	2,099	11	2	13	89	1191·9	7·38	50·54	Woolwich .. 12
Total ..	2,614	2,920	14	7	21	109	1117·0	8·03	41·70	
Depôts of Regiments.	7,687	6,877	79	16	95	526	894·6	12·35	68·43	

As in 1871, the Royal Horse Guards furnished the highest ratio of admissions in the Household Cavalry, and the 1st Life Guards the highest ratio of invaliding. The latter corps also furnished the highest death rate, but it was considerably below the average. The excess of admissions in the Royal

United Kingdom.

Horse Guards was chiefly the result of the prevalence of venereal affections in that corps.

In the Cavalry of the Line, the 2nd Dragoons at Edinburgh furnished by much the highest ratio of admissions, chiefly from the prevalence of bronchitis and sorethroat, secondary syphilis, phthisis, and accidental injuries. The ratio was high also in the 5th Dragoon Guards at York and Manchester, from febrile attacks, boils and ulcers, and gonorrhœa; the 13th Hussars at Leeds and Aldershot from venereal affections; the 3rd Dragoon Guards at Shorncliffe and Maidstone from rheumatism, hepatic affections, and accidents; and the 6th Dragoon Guards at Dublin and Aldershot from syphilis and bronchitis. The ratio of admissions was lowest in the 4th Dragoon Guards at Manchester and Dundalk, and the 14th Hussars at Ballincollig and Newbridge. The ratio of mortality was highest in the 3rd Dragoon Guards, and the 13th Hussars, and lowest in the 14th Hussars and the Riding Establishment at Canterbury, in which there were no deaths; and, after them, in the 9th Lancers at Aldershot, Woolwich, and York, and the 6th Dragoons at Cahir, in both of which it was below two per 1,000. That of invaliding was highest in the 19th Hussars at Brighton and Aldershot, and the 14th Hussars at Ballincollig and Newbridge, and lowest in the 5th Dragoon Guards at York and Manchester.

In the Artillery, the 22nd Brigade, recently returned from India, furnished the highest ratio of admissions, the excess being due to ague, rheumatism, and bronchitis; but in the 1st, 7th, and 11th Brigades also, the average was considerably exceeded. The lowest ratio of admissions was furnished by the Riding Establishment, and the 17th Brigade. The ratio of deaths was highest in the 12th Brigade, and lowest in the 21st. That of invaliding was highest in the 1st, and lowest in the 21st, and the Riding Establishment.

In the Foot Guards, the 3rd Battalion of the Grenadier Guards at London, furnished the highest ratio of admissions, syphilis, gonorrhœa, and glandular affections being the diseases in which the preponderance took place, and also the highest ratio of invaliding. The lowest ratio of admissions was furnished by the 2nd Battalion of the Coldstream Guards, at Windsor, Dublin, and the Curragh, and the lowest ratio of invaliding by the 2nd Battalion of the Grenadier Guards at Dublin, London, and Windsor. The death rate was highest in the two Battalions of the Scots Fusilier Guards, at London and Windsor, and lowest in the 2nd Battalion of the Grenadier Guards.

In the Infantry Regiments the ratio of admissions was highest in the 38th Regiment, at Dover, the causes of the excess being relapses of ague, hepatitis, and other diseases contracted during the recent service of the regiment in India; and lowest in the 91st at Fort George. That of deaths was highest in the 1st Battalion of the 19th at Gosport, the excess being due to the occurrence of nine deaths from pneumonia, for the most part in old soldiers debilitated by Indian service, and lowest in the 47th at Fleetwood and Carlisle, in which there were no deaths. The ratio of invaliding was highest in the 38th at Dover, and lowest in the 94th at Newport.

Re-Vaccination.—The increased proportion of soldiers, not recruits, re-vaccinated in 1871, in consequence of the wide-spread prevalence of small-pox among the civil population, noted in the report for that year, was far exceeded in 1872, the number on whom the operation was performed having been 23,945. This great increase was the result of the issue of "Army Medical Circular," No. 6, dated 1st January 1872, of which a copy was given in the Appendix to the Vol. for 1870. There was a considerable reduction in the number of recruits re-vaccinated, but that was to be accounted for by a corresponding reduction in the number enlisted. The regulation requiring all recruits to be re-vaccinated on joining their regiments or depôts, continues in force.

The following Table, framed from Abstract No. 2 in the Appendix, shows the results of re-vaccination in soldiers and recruits, as reported in the Monthly Vaccination Returns:—

United Kingdom.

	Total number Vaccinated.	Results.	Ratio per 1,000. In those who bore marks of previous Small-Pox.	In those who bore good marks of previous Vaccination.	In those who bore doubtful marks of previous Vaccination.	In those who bore no marks of previous Vaccination or Small-pox.	Total.
Soldiers, not Recruits	23,945	A perfect Vaccine Vesicle	290·9	302·9	333·9	380·6	305·2
		A modified ditto	371·7	409·2	395·7	297·2	403·3
		A failure	337·4	287·9	270·4	322·2	291·5
		Total..	1000·0	1000·0	1000·0	1000·0	1000·0
Recruits..	17,748	A perfect Vaccine Vesicle	289·3	341·5	395·2	514·8	345·5
		A modified ditto	357·8	405·5	342·2	252·5	396·2
		A failure	352·9	253·0	262·6	232·7	258·3
		Total..	1000·0	1000·0	1000·0	1000·0	1000·0

Compared with the results for 1871, this Table shows a considerable reduction in the proportion of perfect vaccine vesicles, and an increase in that of modified vesicles, in both classes. Among the soldiers there was an increase, and among the recruits a reduction in the proportion of failures. Among the former, the reduction in the proportion of perfect vesicles extended over all the classes except that of men who bore doubtful marks of previous vaccination; among the latter it extended over all classes. The proportion of modified vesicles was higher in all the classes of soldiers, except those who bore no distinct marks of previous vaccination or small-pox, and in all the classes of recruits. That of failures was higher among all classes of soldiers except those who bore doubtful marks of previous vaccination, and among all classes of recruits except those who bore good marks of previous vaccination.

The proportion of perfect vaccine vesicles was considerably smaller, and that of failures considerably greater in soldiers than in recruits, the class in which the difference was greatest being that of men who bore no marks of previous vaccination or small-pox. The strength of that class was comparatively small, and so far as the soldiers are concerned, all or nearly all the men belonging to it had no doubt undergone vaccination previously, some of them probably several times.

The following Table shows the condition as to vaccination of the recruits found fit for service at the head-quarters of the several recruiting districts, during the year:—

United Kingdom.

Recruiting Districts.	Marks of Small-Pox.	Marks of Vaccination.	No satisfactory Marks.	Proportion in every 1,000 Primarily Inspected. Marks of Small-Pox.	Marks of Vaccination.	No satisfactory Marks.
London	121	4,307	46	27·0	962·7	10·3
Portsmouth	3	142	1	20·5	972·6	6·9
Devonport	9	145	8	55·5	895·1	49·4
Bristol	22	345	7	58·8	922·5	18·7
Birmingham	38	504	37	65·6	870·5	63·9
Peterborough	1	32	4	27·0	864·9	108·1
Manchester	36	406	46	73·8	832·0	94·2
Liverpool	53	587	21	80·2	888·0	31·8
York	..	67	10	..	870·1	129·9
Edinburgh	21	212	6	87·9	887·0	25·1
Glasgow	29	393	70	58·9	798·8	142·3
Inverness	..	15	..	..	1000·0	..
Dublin	42	566	15	67·4	908·5	24·1
Total England ..	283	6,535	180	40·5	933·8	25·7
Total Scotland ..	50	620	76	67·0	831·1	101·9
Total Ireland ..	42	566	15	67·4	908·5	24·1
Total ..	375	7,721	271	44·8	922·8	32·4

Compared with the results for 1871, there was a decrease in the proportion of recruits bearing marks of small-pox, in Great Britain, and an increase in Ireland; an increase in the proportion bearing marks of vaccination in England, and a decrease in Scotland and Ireland; and a decrease in the proportion bearing no satisfactory marks, in England, but an increase in Scotland and Ireland. The proportion bearing no marks, in England and Ireland, was only about 2½ per cent., but in Scotland it exceeded 10 per cent. The great majority of the recruits bearing no marks, in the latter country, were enlisted at Glasgow. Of the few men enlisted at Inverness there were none without marks, and of those enlisted at Edinburgh the proportion without them was only 2½ per cent.

SANITARY REPORT.

Aldershot.

Inspector-General Dr. Fraser, C.B., reports that the health of the troops has been good, the ratio of constantly sick having been 39·58, and of deaths from all causes 8·48 of mean strength. It does not appear to have been affected by any sanitary defects, but some improvements, conducive to the health and comfort of the troops, are recommended to be carried out as soon as practicable.

The supply of water from the Bourley Reservoirs has been increased to admit of its being continuously and regularly laid on to the ablution rooms and baths in the South Camp. Several sanitary improvements of a minor character have been introduced during the year.

Eastern District.

Deputy Inspector-General Stewart remarks:—The Surgeon-Major, 10th Hussars, lays much stress on the impropriety of allowing access to the canteen for liquor before the dinner hour, as tending to confirm in the old, and origi-

nate in the young, soldier, a craving for drink. I think he is quite right. He also refers to the bad drainage of the cavalry barracks. This is evident, as is also that of the barrack yards at Norwich and Yarmouth, especially at the latter station. The latrine system generally in the district is faulty. Dry earth conservancy has been introduced into the Colchester Hospital, and ought to be adopted throughout the camp; but the existing arrangements here are far preferable to the cess-pits in use at some of the out-stations, *e.g*, Ipswich and Yarmouth. All these are, I think, greatly in need of alteration according to the modern standard of sanitation.

Much has been done to improve the accommodation in the Norwich Barracks. Increased hospital accommodation, however, is very much required.

At Yarmouth, in addition to the very bad state of drainage of the barrack yards, one of the latrines is at present closed up. The accommodation for married people is also very bad. Five or six families have to be put up, as best they may, in one large room.

There have been some improvements, at nearly all the quarters, in the means of ablution; and, at Norwich, water has been laid on to a large tank (18,000 gallons) in the barracks, which will supply all requirements.

The rations generally have been good, without any change in quantity. The cooking arrangements are satisfactory, and there are facilities for varying the same. Vegetables are abundant. A little more meat and less bread would be an improvement on the present rations.

The new scarlet tunic for the infantry is a vast improvement, in appearance at least, over the old red one.

The following sanitary services have been carried out by the Royal Engineers during the past year:—

At Colchester.

1. Providing small taps for private ablution-rooms in the cavalry barracks.
2. Enlarging and improving prisoners' room, main guard.
3. Enlarging schoolmasters' quarters in camp.
4. Enlarging tailors' and shoemakers' shops, cavalry barracks.
5. Improving ventilation of camp church by making the window sashes moveable.

At Norwich.

1. The greater part of the barracks have been reconstructed so as to give increased height to the rooms and better accommodation to all classes.
2. At the west wing of the barracks the latrine system has been improved by the introduction of Jennings's Patent W.C., in place of the old cesspool system, and the remodelling of the rest of the latrines has been provided for in next year's estimates.

At Ipswich.

1. The ablution-rooms have been newly and completely refurnished and fitted up, and are now in very good condition.
2. The superficial drainage is faulty, and the latrines are bad and require alteration.

At Yarmouth.

One latrine has been put in order and refitted on MacFarlane's principle; the others require the same treatment, and the lavatory needs alteration and refitting.

The water supply appears good and abundant throughout the district for all purposes.

All the medical officers at Colchester speak much in favour of the Garrison Gymnasium, and there is every reason to be satisfied with the result of the institution on the physique and stamina of the young soldier.

As regards venereal disease, the beneficial working of the Contagious Diseases Act at Colchester is unquestionable. There have been comparatively few admissions for syphilis, and, as a rule, the cases have not been severe, and but seldom followed by constitutional symptoms.

United Kingdom.

The Surgeon, 7th Dragoon Guards, at Norwich, deplores the condition of his regiment from syphilis of a bad form; and no detachment rejoins head-quarters of its regiment at Colchester from Yarmouth or Harwich which does not furnish several, indeed many, cases of venereal.

South-Eastern District.

Deputy Inspector-General Gordon, C.B., reports:—In the summer and early autumn, small-pox prevailed extensively among the civil population, and fears were naturally entertained of its extension to the troops. Vaccination and re-vaccination were carefully carried out among all classes of the military, and sanitary measures were taken for their protection, the results being so satisfactory that only four men of this garrison of Dover were attacked, and of these none died. A recruit, from Ireland, was admitted into hospital with the disease three days after his arrival in garrison, and the attack was fatal; yet, notwithstanding that he was treated in the regular hospital, in the absence of a separate building for infectious cases, the precautions taken prevented the disease from extending to the other patients.

Dover (Western Heights).—During the year a good deal of correspondence took place in reference to the sanitary arrangements connected with the north casemates, such improvements being effected in them as their construction and purposes rendered practicable.

The state of the drainage in connection with the guard-room at the Grand Shaft underwent an improvement.

The necessity for separate accommodation in this garrison for cases of infectious disease occurring among soldiers, their wives and families, was demonstrated by the fact of an outbreak of small-pox having prevailed among the civil population. A building for the purpose was provided for in the annual estimates for 1873–4.

Shorncliffe.—Various improvements were effected in the buildings in this camp. Porches were erected at one end of the men's huts, the doors at the windward end being closed. The water supply of the hospital was improved.

A number of sick and weakly men were sent to Shorncliffe from other stations, in the month of July, for change of air and sea-bathing.

Canterbury.—Among the improvements proposed by the Senior Medical Officer at this station are:—(1.) A waiting-room for patients in the Depôt Hospital. (2.) A suitable wall, or iron railing, to form an enclosure for that building, and impede the free communication now practicable between the convalescent patients and persons who desire to visit them clandestinely. (3.) A suitable quarter for the Medical Officer in the vicinity of the hospital.

Brighton.—The present inconvenience in the position of the wash-house, and the absence of a suitable drying-room have been noticed. Various improvements have been effected in the barracks, and others are contemplated.

Eastbourne.—Considerable improvements have been made in the accommodation for the married soldiers at this station.

Newhaven.—The water supply has been much improved, filters established, the existing wells thoroughly cleansed, and suitable conduits formed thence to the barracks.

The Contagious Diseases Act is in force at Dover, Shorncliffe, and Canterbury. At none of the stations in this district are there special arrangements or nightly private ablutions by the men.

Chatham.

Deputy Inspector-General Bowen reports that several minor matters, with regard to the large and important barracks occupied by the Royal Engineers at Brompton, require attention; *e. g.*, increased space and ventilation for the guard-room, prisoners' room, infant school, tailors' shop, ablution-room, and room for inspection of sick, &c. These have all been duly reported and put forward in the estimates. The sanitary condition of the other barracks at

Chatham is good, with the exception of some drainage at the Army Service Corps Barracks; this also has been provided for in the estimates for immediate execution. *United Kingdom.*

The necessity for quartering men at Tilbury Fort and the Isle of Grain causes considerable increase of sick under the head of ague. Both places are situated in the centre of undrained marshes in a district where ague is always rife. Men quartered there are frequently attacked; and, as many of them have previously suffered from ague in India and elsewhere, severe relapses are very common. The Medical Officer at Gravesend recommends the planting of trees round Tilbury. He states that he has seen the salubrity of malarious districts singularly improved by this proceeding.

There exists in the barracks an arrangement for the nightly private ablution of the men. The Contagious Diseases Act is in force in this district, and I am of opinion that the number and severity of the syphilitic cases is immensely decreased in consequence.

Southern.

Inspector-General Monatt, C.B., V.C., reports:—During the twelvemonth great alterations have been made on Government Land, in and around the towns of Portsmouth and Portsea, by the demolition of the old line of ramparts round the latter town, the filling in of the outside moat, with its stagnant water so often complained of in previous years, and the covering with earth of the adjacent mill-dam. These works will form a great improvement to the town. Many new roads are being laid down for the public use, the large space of ground, given by the destruction of the ramparts, will admit of large and commodious barracks being erected, in place of the old and condemned ones. A site has already been proposed for a contagious disease hospital instead of the old and very inconvenient wooden structure used at present. As a matter of health, the removal of the ramparts allows of a much more free circulation of air, round the Military Hospital especially; and the filling up of the mill-dam and moats does away with the offensive, and probably injurious, effluvia, so much complained of during the summer.

Various minor alterations and improvements have been made at several of the out stations during the year; amongst others the erection of new latrines at Fort Monckton. Latrines on the dry earth system are in course of construction at Chichester, and, judging from the working of one or two closets that have been completed, the Medical Officer thinks that the result will be very satisfactory. Latrines on this principle are also to be erected at Christchurch.

The health of the district has been very satisfactory during the year, and the troops have enjoyed a great immunity from disease of an epidemic character. During the early part of the year small-pox prevailed to a considerable extent amongst the civil population. But few cases of this disease occurred among troops composing the garrison, only 10 being admitted, 1 of which proved fatal.

The garrisons of Portsmouth and Winchester are protected by the Contagious Diseases Acts, the operation of which appears to have been attended with very beneficial results as regards the decrease of venereal disease among the troops. All the Medical Officers in charge recognizing the fact, that not only has a diminution in the number of admissions taken place, as compared with years before the Acts came into operation, but that the cases admitted were of a lighter kind, and more amenable to treatment.

Woolwich.

Deputy-Inspector-General Gordon reports that the general health of the troops has been very good; there have not been any notices from the Medical Officers of causes likely to be prejudicial to health.

Several sanitary improvements of a minor character have been effected during the year.

United Kingdom.

The Royal Victoria Hospital, Netley.

Inspector-General Innes, C.B., in his annual sanitary report of the above establishment, remarks :—

The admissions into the Royal Victoria Hospital during the year 1872, have been as under :

Invalids from foreign stations	2,112
Invalids from home stations..	6
Army Hospital Corps...	61
Garrison patients	55
Time-expired men of Discharge Depôt	13
Extra patients	1
Men re-admitted before leaving the station	10
From Blandford (Autumn Manœuvres)	150
Re-admissions do.	2
Total	2,410

Of the invalids from India, 1,395 arrived *vid* the Suez Canal, and 301 by the Cape route. The garrison patients were men from the detachment, Army Service Corps, Netley ; guardsmen from London ; men of the Royal Engineers stationed in Southampton ; and of various corps stationed at Aldershot. The extra patient was an officer's servant.

The highest number of patients in hospital during the year was 1,025, viz., on the 27th and 28th April. The lowest number, 41, on the 27th and 28th March.

On 65 days the numbers were over 500. The average daily number in hospital being 263·95.

The new arrangements for the transport of invalids from India to England have worked very successfully. The men enjoy the best of the cold season in India, and arrive in England in the spring and summer months, and in consequence of this (as I believe) a large proportion of them have, on arrival at Portsmouth, been found fit to join their Depôts direct ; and those who have been sent on to Netley have convalesced speedily.

During the months of July, August and September, the spare beds in the hospital were utilized by sending 60 boys from Chelsea Asylum, in batches of 20, to enjoy the sea bathing and fresh air at Netley.

The water supply has been adequate, and of good quality.

The fittings of the lavatories are so delicate, and the expense of repairing them so great, that the water has been turned off, and hand-basins used.

The drainage of the yard in rear of the hospital has lately been much improved, and is now adequate.

The quarter for the Medical Officer in charge of the Lunatic Hospital is approaching completion. I beg strongly to corroborate the suggestion of my predecessor, Inspector-General Beatson, as to the urgent necessity for quarters being erected for the senior married Medical Officers in charge of divisions in the hospital.

Western District.

Deputy Inspector-General Munro, C.B., in his Annual Sanitary Report for 1872, discusses very exhaustively the various sanitary defects existing in the different stations of the Western District, commencing with those of the garrison forming the head-quarters of that district. Dr. Munro, after adverting to the general town drainage, and pointing out what he considers objectionable in that system, proceeds to say :—

During several months of the past autumn, enteric fever has been more or less prevalent in the town of Devonport, and in some of the villages in the neighbourhood ; and in October, November and December, a number of cases (about 30) of this form of fever occurred amongst the troops and their families. Some of these cases came from Mount Wise Barracks, several from Raglan

Barracks, but the majority from the married quarters near Raglan Barracks. The disease has not been confined to any particular corps, though the majority occurred amongst the women and children of the 2nd Regiment; and those in the Royal Artillery at Mount Wise Barracks occurred almost immediately after their occupation of these barracks, which had been empty and closed for some months previously, and had not been thoroughly aired before re-occupation. The married barracks consist of four blocks of buildings forming a square, closely shut in by a high stone wall, against which, and too close to the quarters, the latrines and urinals are built. Mount Wise Barracks consist of a number of small buildings, also surrounded by a high wall, and situated close to the most crowded and dirty part of Devonport. They are not well supplied with water, and the ill-ventilated latrines, too few in number, are placed in the corner of the barracks, in too close proximity to several of the quarters, in which one of the first cases of enteric fever occurred. *United Kingdom.*

In Millbay Barracks, Plymouth, the rooms require more ventilation, and kitchens are urgently required.

The married barracks and Mount Wise Barracks are, I consider, surrounded by insanitary conditions.

On the appearance of enteric fever amongst the troops and families, I recommended increased care in our conservancy within barracks, such as perfect cleanliness of surface, free ventilation of barracks, and more careful and frequent flushing of latrines. This was ordered to be carried out, and a larger supply of water for flushing latrines was sanctioned. At the same time, I made a careful inspection of the leats, or water channels, along which our supply of water for the towns and for the troops is conveyed; and also caused a qualitative analysis to be made of water, taken from the reservoir tanks in barracks, and from the leats in different parts of their course. I found the leats perfectly open and unprotected, from within three or four miles of the town, up to their sources in the Dartmoor Hills. I found them not only unprotected from, but in many places liable to, the most filthy pollution; and, after careful analysis, detected impurities in water taken from the Devonport leat, where it flows past the Dartmoor Prison. I have already (and specially) reported all that is herein stated with regard to the water supply, but the correspondence has not as yet been attended with any practical result. The Major-General Commanding and the Control Department, however, have shown every desire, and made every effort, to remedy defects which have been represented by me to exist.

The sanitary condition of the General Hospital, Stoke, I consider imperfect, and much is required to make it comfortable. The water tanks within the building are not covered over, and, in more than one part of the building, these tanks are under water-closets and bath-rooms; though there may never be any leakage from the water-closet pans or escape pipes, still such a thing is possible; and whenever the seat and floor of the closet is washed, the water used for this purpose may (and does, I am told) drip into the open tank below. The same remark applies to some of the bath-rooms. The water-pipes, the escape-pipes, and the urinary-pipes are constantly getting out of order, and the tanks frequently leak. All this I have reported, and suggested that a careful examination of tanks, pipes, &c., be made in my presence; but I have not heard anything in reply. The different buildings of which the hospital is composed are very cold and draughty in winter, and double doors are much required in the principal entrance of each block; if these doors were put up, the large hall-stoves might be done away with, and the expense of fuel saved. The painting of the wood work, the whitewashing of walls, the window blinds, everything in fact about the interior of the hospital, requires to be renewed, improved, and carefully repaired. Nowhere in the district has special accommodation for infectious disease been provided. A hospital for this class of disease is urgently required in this garrison, and detached wards for the same purpose at all out-stations.

The sanitary necessities of this garrison therefore are, a more careful system of drainage and sewerage, improved conservancy, a plentiful supply of pure water, means of treating infectious disease, and a careful and thorough repair of the general hospital.

Exeter.—In Topsham Barracks, the drains behind the stables are very defective. The water-closets require a more constant supply of water. The

United Kingdom.

water supply is not sufficient at all seasons, but new arrangements for a better supply have been submitted to the War Office for approval. A better ablution room is required in the hospital, and application has been made for authority to provide one. In the cavalry barracks, at the same station, the drains near the stables, though lately repaired, are still defective. The dead-house is out of repair; it is small, imperfectly lighted and ventilated, and indeed, in its present state, it cannot be used.

Bristol.—The laundry requires several improvements, and, in one part of it especially, better ventilation. A better supply of water is required. Proper water-closets in the hospital are urgently required. The old cesspit privies within the hospital enclosure should be removed. The dead-house requires a new floor, also increased ventilation, and water should be introduced into it.

Trowbridge.—The barracks are too small for a battery of Artillery. A new hospital is required, as the present one is simply only a makeshift. A better supply of water is urgently required. The old cesspits, now not required as the dry-earth system is in use, should be completely filled in. Some means of amusement for the men should be supplied.

Newport.—Cesspit privies in use at this station should be done away with, and so should the wells which are in close proximity to these cesspits. A good supply of water is urgently required. A new cooking range is urgently required for the hospital kitchen. The dead-house requires better lighting and better ventilation, and the introduction of water.

Since I made my last inspection (in December last) cases of enteric fever have occurred at this station, supposed to have been caused by the use of water from one of the wells which is close to a cesspit privy. The well has been closed in consequence. I have reported the insanitary conditions existing within this barrack.

Brecon.—The drainage and general conservancy of the barracks at this station are defective. Most offensive cesspit privies are in use within the barracks, and all the wells are in close proximity to the cesspits. In the early part of the year several cases of enteric fever occurred amongst the troops and families, and, in consequence, the attention of the Medical Officer then in charge was drawn to the insanitary conditions existing; on enquiry he found that all the wells and tanks were polluted. Since then, the well and tank water has not been used, except for washing and cleansing purposes, and water from the town pipes has been introduced into barracks for drinking and cooking.

Much is required at this station. The ventilation of barrack rooms should be improved; drainage and drains should be carefully attended to; all cesspits and polluted wells should be filled up, and a plentiful supply of pure water should be introduced into barracks and hospitals.

Note.—A short time after the order was issued that the men were not to drink water from the wells, a case of enteric fever occurred; and on enquiry it was found that the man, a young soldier, had been drinking water from one of the polluted wells, which is within twenty feet of a cesspit privy.

Pembroke Dock.—The school-room in the Hut Encampment requires more ventilation, but I am informed that it is in contemplation to use another building as a school-room. The lock-up room requires more ventilation also. Drainage is bad, as around many of the huts there are no paved drains. There is no foul-water drain in the camp. Both services should be attended to, and I am informed that they are included in the B. Estimate for 1873-4. The long centre passage into which all the hospital wards open, requires more ventilation. This also, I understand, is included in the B. Estimate for 1873-4.

The latrines in the Defensible Barracks are very objectionable. They are deep trenches paved on the bottom, and capable of being flushed. They are simply cesspits. There are no partitions in them to afford the privacy necessary to common decency. This was reported by me, through the local military authorities, but nothing has been done in the matter further than to include the work in the B. Estimate for next year. One of these latrines is situated behind and below one of the officers' quarters, but it is impossible that this quarter can be occupied till the latrine is removed. The latrine has been locked up, but this is not sufficient; it must be removed altogether. The lavatory used by the men, Royal Artillery, is too small, and I have proposed

that a large room on the basement floor should be fitted up as a lavatory. This is under consideration, and the Commanding Royal Engineer reports that the work can be done at a cost of 60*l*. It is a very necessary work, for at present 80 men have a room not 14 feet square to perform all their ablutions in. *United Kingdom.*

In Devonport, Stonehouse, and Plymouth, the Contagious Diseases Act is in operation, and there are means for private nightly ablution in barracks.

Sanitary Improvements.

A few improvements have been effected during the year, which are as follows:—

The conservancy in the several barracks in this garrison has been improved, in so far as that a larger supply of water has been sanctioned, by the Major-General Commanding, for flushing latrines an durinaries more frequently and more perfectly. A new latrine has been erected for the married barracks, Devonport; but I do not think that it has been placed in a good position. A decided improvement has been made in the washing of hospital linen; and hair mattresses, pillows, and bolsters are opened and re-stuffed with more care. This refers to the whole district. The drainage and sewerage of the officers' quarters in the Gun Wharf has been much improved. A long correspondence has taken place on the subject of protecting the water supply of Devonport, &c., from pollution. Nothing has actually been done in the matter, further than reference and correspondence. The hospital for infectious diseases amongst women and children has been removed from Granby Barracks, as the space there set apart for it was required for the accommodation of troops. Rooms in the upper flat of one of the blocks in the General Hospital, Stoke, are now used for the purpose. Sanction has been given, at my request, to put in complete repair the rooms in Stonehouse Redoubt (as a temporary arrangement) for the reception of cases of small-pox, should any such occur, either amongst men, or women and children in the garrison. Arrangements therefore have been made, though only of a temporary nature, for the care of every class of disease. A proposal was made by me to fit up, as a reading and recreation room for convalescent patients, a portion of the ward in the General Hospital used as a chapel. Application has been made, on my recommendation, for wooden gratings for ablution rooms, and for new basins; also for hard wooden blocks or planks, for cutting up meat, vegetables, &c., upon, in kitchens. Large wooden screens have been sanctioned, to separate families from each other, when more than one family occupy the same room. At Brecon, a small supply of good water has been introduced into barracks, by the Control Department, from the town pipes. This was urgently required; but a larger supply is needed, and a tap should be carried into the hospital. Gas has been introduced into the Hospital Hut Encampment, Pembroke Dock.

Female General Hospital.

The Female General Hospital has been during the year in a most satisfactory sanitary condition, and is an inestimable boon to the wives and families of the troops. It has been under the careful supervision and management of Staff Assistant-Surgeon M'Nalty.

Northern District.

Deputy Inspector-General Ewing reports very fully as to the sanitary requirements at the different stations within the district under his medical charge; but, as these were indicated in the published Report of last year, it is not considered necessary again to detail them. A number of improvements, —and services of a minor character—have been effected during the year.

United Kingdom.

North British District.

Deputy Inspector-General Barclay's sanitary report contains the following remarks:—

Barracks and Hospitals.—Almost all the barrack accommodation in the command is of an inferior description, the barracks being old and constructed on an obsolete plan, little favourable for thorough ventilation. The absence of through ventilation is in fact their chief fault. It is probable that most of them will ultimately be replaced by buildings of a more suitable description, and this is certainly very desirable on sanitary grounds, but, in the meantime, much has been done and is being done, for their improvement, by the addition of new means of ventilation, and the removal of obstacles to the free ingress and egress of air. A favourite plan seems to have been the construction of a central corridor, the rooms being arranged on either side of it. This, of course, renders efficient through ventilation impossible, and the contamination of the air in the leeward rooms, by that which has actually passed through those on the windward side, unavoidable. Free roof ventilation of the corridor reduces the latter evil to a minimum in some of the barracks, but in others, and notably in those at Fort George, no such ventilation of the corridor exists. It is very desirable that it should be provided everywhere, until the barracks can be re-modelled, and the corridors done away with, as is being done at Piershill. At Glasgow the barracks are both badly situated,—being in the centre of one of the most densely populated quarters of the city,—badly planned, old, and dilapidated. The same remarks apply to the hospital. It is very desirable, on sanitary grounds, that the new barracks at that station should be completed as soon as possible.

Some of the lower rooms in the barracks at Edinburgh Castle are quite unfit for permanent occupation, and it is desirable that they should be vacated, on the completion of the new family quarters now being constructed.

As a rule, the regulated amounts of cubic and superficial space per man have been available in barracks, and much more in hospitals; but at each of my inspections I found one man in excess of the allotment in almost every room at Fort George, although the barrack returns show ample accommodation for the garrison there; and in the beginning of the year it was found necessary to put an additional bed into each ward in the Royal Artillery Hospital at Leith Fort. No injury to health appears to have resulted from the overcrowding in either case.

The hospitals in the command are generally less open to sanitary objection than the barracks, but several of them are very old buildings. That at Glasgow has already been referred to. That at Edinburgh in the Old Parliament House at the Castle, is not in a satisfactory condition. Although it is kept scrupulously clean, a close musty smell is perceptible in the wards, when the windows are closed. This probably proceeds, to a considerable extent, from decayed woodwork, but, as the walls also may be to some extent in fault, I have recommended that they be thoroughly scraped before being again limewashed.

The limewashing of both barracks and hospitals has been carried out in accordance with regulation during the year.

The ventilation of the cells and prisoners' room at Piershill was greatly improved during the year. Those at Fort George are reported to be always damp; a fire has to be burned in the prisoners' room.

Kitchens and Cooking.—The kitchens, and the utensils in them, were kept clean and in good order during the year, and the means of cooking, which they contain, were found sufficient to make the rations satisfactory and sufficiently varied. Dean's apparatus is used in some of the kitchens, and Warren's in others. The former seems to be generally preferred by the men, as it is more easily worked, and less liable to get out of order; but some prefer the latter, and when in order it certainly works admirably. Such repairs as became necessary during the year either have been executed, or are to be executed immediately. Towards the end of the year a new kitchen range was provided for the hospital kitchen at Dundee, where it was much required.

Lavatories and Baths.—The lavatories are generally sufficient and well

supplied with water, but the number of baths is too limited. But a small proportion of the men can take advantage of them daily, though, in the winter months, that proportion is probably equal to the number who care to do so. An excellent rule existed in the 90th Regiment which occupied Glasgow, Ayr, and Stirling, during the first half of the year, in accordance with which every man was required to wash himself from head to foot with soap and water at least once a week, and officers commanding companies had to certify that this was done. In the absence of such a regulation, it is to be feared that, during the colder months, the ablutions of many of the men do not extend beyond their hands, faces, and feet.

Bathing parades were held during the season suitable for them, wherever they were practicable.

Latrines and Urinals, Drainage and Condition of vicinity of Barracks.—The latrines and urinals have, for the most part, been kept in good sanitary condition, and, with the exception of the hospital latrine at Paisley, one of those at Dundee, and at Hamilton, none of the former are now on the cesspool system. The necessity for remodelling, or removing, the cesspool latrines which remain has been brought to notice.

A good deal of correspondence took place, during the summer, about two of the barrack latrines at Hamilton, constructed on Macfarlane's plan, from which the fluid part of the contents is supposed to be discharged through a perforated stone into one of the main drains, the solid part being removed daily in an open cart. The discharge pipes had become dilapidated, and leaked into the adjoining dung pits, an offensive nuisance being the result. The Medical Officer now in charge states in his report that nothing was done, but that the nuisance gradually abated. This, however, is a mistake. The discharge pipes were repaired, and leakage from them prevented. On the occasion of my winter inspection, there was no nuisance traceable to these latrines, but it was obvious that the adjoining dung pits had not been so thoroughly cleaned out as they should have been.

The system of discharging part of the contents of the latrines into a drain, and part into a cart, is, however, obviously a bad one, and likely to lead to a nuisance at the point of division, and it would be better if all were discharged into the cart, as is done elsewhere. A close cart, however, would in that case have to be provided. At the date of my last visit, the drain was choked and overflowing.

The drainage of the several stations is generally fair, and the condition of the drains attended to. The necessity for some improvement at Hamilton has been brought to notice. Great improvements have been effected during the year at Perth and Fort George. At the latter station, where the drains were formerly very offensive, pipes have been substituted for stone drains, and no disagreeable effluvia are now perceptible near the grated openings into them.

The military authorities have done their best to keep the vicinity of all the barracks and hospitals in a good sanitary condition; but at stations where the barracks are in large cities, as at Glasgow and Aberdeen, the air which reaches them may be contaminated by sources of impurity beyond the reach of military control. There is difference of opinion as to the effect on the health of the troops at Piershill of the long-established sewage farm, which approaches the barracks very closely on their north and north-west sides, and from which a disgusting smell is perceptible in the barrack square, when the wind blows from those quarters. There have been no admissions for fever, and there have only been eight for diarrhœa, in the part of the cavalry regiment (Scots Greys), 305 strong, occupying these barracks during the year; but there have been 14 admissions for phthisis, only 4 of them being re-admissions; and the Surgeon-Major informs me that he finds some difficulty in getting sores to heal in the regimental hospital. In the portions of the same regiment at Hamilton and Perth, 213 strong, there was only one admission for phthisis. This difference, however, cannot be altogether put down to the greater unhealthiness of the barracks at Piershill, as the duty is harder at head-quarters than on detachment, and it is customary in the regiment to retain sickly men at head-quarters, if practicable, when their troops proceed on detachment.

Duty, Employment, and Amusement.—The duty is nowhere reported to have

United Kingdom.

been excessive, nor does it seem to have produced any prejudicial effect on health; but night duties can never be unattended with wear of constitution and risk to health. Those duties have been more severe at Edinburgh and Piershill than elsewhere, and these are the stations at which phthisis has been most prevalent. That a favourable effect on health might be expected could their severity be reduced, there can be no doubt.

During the very severe weather the men on guard were, at some stations, on the recommendation of the Medical Officers, kept on sentry for one hour only at a time, instead of for two, with a good result.

The only station at which there is a gymnasium is Aberdeen. The men there go through the course of instruction in parties of fifteen, under a trained instructor, a careful examination being previously made as to their fitness by the Medical Officer. The effect of the course on health and physical development is reported to be most satisfactory, the chest and arm measurements being almost invariably increased by it; but the Medical Officer informs me that, unless the exercises are kept up, the benefit is not lasting, and the measurements soon fall within original standard. This, however, only indicates the necessity for the men being put through the course at regular, and more frequent, periods. At an isolated station like Fort George, where the means of employment and amusement are so limited, a gymnasium would be a most useful institution, and its establishment would be a great boon to the men; but there is nothing of the kind here. At Piershill a room is set apart for fencing and athletic exercises, and the men are required to attend. Elsewhere there is nothing of the kind.

Means of engaging in out-of-door games exist at all the stations, but their extent is very limited, and, in this direction, much still remains to be done. At Fort George, where the need for means of amusement is greatest, there is only a fives court.

I attribute to the exceptional inclemency of the season the unusual prevalence of phthisis and bronchitis at Edinburgh and Piershill, the former disease having, in my opinion, been developed thereby in men more or less predisposed to it, but who might have escaped it under more favourable circumstances, and in a less trying climate. There can be no doubt that even in ordinary years the climate, at all the stations on the East Coast of Scotland, is a very unsuitable one for weakly men, more especially if they have to be exposed at night on sentry, and that men who have recently returned from India are liable to suffer seriously in health from exposure to the harsh east winds, so prevalent at all these stations in spring. In all regiments returning from India, there are many men suffering either from the effects of malaria, or from a tendency, more or less pronounced, to hepatic, dysenteric, pulmonary, or rheumatic disease, or from a syphilitic taint, for all of whom such a climate is obviously unsuitable, and experience shows that such men do suffer in it to a serious extent. It would unquestionably be far better for the health of the men, if regiments, returning from India, were detained in the South of England for a year before being sent to Scotland; but, even without such acclimatization, the evil at present experienced might, it appears to me, be greatly reduced in amount, were advantage taken of the means which exist, or which, at any rate, might easily be made available, for obviating it. The climate of Ayr is very much milder than that of any of the stations on the East Coast, and far more suitable for men in the condition above mentioned. The new barracks there are admirably situated, and well constructed; and a marked difference is observable between the appearance of the men stationed there (after a residence of a few months) and that of their comrades, with the head-quarters of their regiment, at Glasgow. I have been struck with this on the occasions of my inspections. The former are always much the more robust and healthy-looking. If Ayr were utilised to some extent as a sanitarium, and, on the arrival in Scotland of a regiment from India, all men of the classes, above referred to, for whom the climate might be considered desirable, were sent there for, at all events, the first winter, it would, I feel assured, be the means of preventing much sickness, and not a little mortality.

The climate of Ayr is sometimes said to be too relaxing for persons in robust health, but it is just such a climate as men, injured by tropical service, require.

It is also a climate which would often be found suitable for weakly men with a tendency to chest disease, who have not been in India; and such men might often be sent to it, with advantage, for the winter and spring months. *United Kingdom.*

IRELAND.

Inspector-General M'Illree reports:—The general health of the troops in the command, during the period embraced in this return, has been good; and although small-pox prevailed during the year throughout Ireland, yet the cases amongst the troops were only 37, owing to the strict attention paid to vaccination, in accordance with the instructions contained in Army Circular No. 6, dated 1st January 1872.

The water supply at various stations has occupied a good deal of attention; and, where any doubt of its purity existed, samples have been sent to Dublin for analysis, and steps taken to have the supply, where requisite, improved.

I have represented, to the General Officer Commanding in Ireland, that a separate building for the treatment and isolation of soldiers and their families, suffering from contagious disease, is urgently required in Dublin.

The Principal Medical Officer at Cork has also represented the want of such a building for the use of the troops at that station, and an item to provide for this service will be inserted in the annual estimates.

The reconstruction of latrines on "Moule's Earth System," at several stations, has been attended with the best results, and will be gradually carried out, as funds are available.

Dublin District.

Deputy Inspector-General Foss reports:—The sanitary condition and position of Island Bridge Barracks would be much improved by the Government becoming possessors of a small amount of land, close to the wall of the barracks, on the river side, and removing the people and the small wretched hovels in which they live. These miserable habitations are encompassed by foul courtyards, cattle sheds and pig styes.

The water supply is generally reported to be good and sufficient. The question of supplying Richmond Barracks and Island Bridge with Vartry water is one deserving of consideration. Vartry water is supplied to the public outside, and might, at a small outlay, be conducted within the barracks, and used for drinking purposes.

Curragh District.

Deputy Inspector-General Grant reports:—Defective bath and ablution accommodation is complained of by the Medical Officers in charge of Royal Horse Artillery, 14th Hussars, and Royal Artillery at Newbridge. The barracks and hospital have been lately supplied with a complete system of water-works, but the water supply has hitherto been found inadequate, and no water has yet been laid on. The well, from which the water is to be obtained, has to be deepened, and as soon as this is done and a sufficient supply of water provided, the means of ablution and of flushing water-closets will be sufficient.

The following additions and improvements have been made in the barracks and hospital accommodation, viz.:—

Curragh Camp—Four concrete huts have been built in "C" Square. These huts have 570 cubic feet per man, instead of 320 as in the wooden huts, and are provided with ventilating grates and a Canadian ventilator on the ridge; the roofs are of slate. The ventilating grate is placed at one end, and opposite to it is the door, the draft from which is checked by means of a wooden screen. The lighting is effected by windows opposite to each other at the sides. These windows are perhaps rather too large, making the room cold in winter, and

United Kingdom.

admitting a glare of light in summer when there is any sunshine. The fire-place being at the end is certainly a fault in construction. It is doubtful whether one fire-place will be found sufficient for so large a room, but the heat would be more easily distributed if it were placed in the middle of the side wall, or if, instead of the ventilating grate, a stove, similar to those used in the wooden huts, had been placed in the centre of the room.

Newbridge.—A bath and ablution-room have been added to each hospital, also a new dead-house, fitted with all the modern appliances; but, as before stated, water is not available for them.

Naas.—The barracks and hospital have been reappropriated at 600 cubic feet per man, and 1,200 per patient; and the accommodation has been thereby reduced from 336 to 198 for soldiers, and from 30 to 12 for patients.

Venereal Disease.—The Contagious Diseases Act has been in operation during the whole period.

South-Western District.

Deputy Inspector-General Murphy reports that the health of the troops in the South-Western District, during the year 1872, may be considered to have been good, and although small-pox prevailed epidemically throughout the district, the cases of that disease in the troops were few, and only three proved fatal. The freedom from small-pox, and its limitation, are in a great measure due to the means adopted by the Medical Officers in charge, by whom the instructions laid down in Army Medical Circular, No. 6, dated 1st January 1872, were fully carried out, and also to other local sanitary precautions. Revaccination has been carefully attended to. Enteric fever and measles have been prevalent at Fermoy and Cork.

The cess-pit system of latrines, which still exists at many of the stations, is doubtless most objectionable. At Fermoy particularly, notwithstanding the closest attention to cleaning and deodorising, the latrines were found to be highly offensive, and the reconstruction of them on Moule's Earth System has been urged on the authorities. The latrines at Kinsale, Kilkenny, Ballincollig, and some of the detachment stations, are on the cess-pit plan, and highly objectionable. Moule's Earth System, which has been introduced at Buttevant, Youghal, Limerick, and other stations, has acted well as a rule, and Jennings's and Macfarlane's Patent Water Systems are very great improvements.

The water supply, during the year, has been abundant.

The gymnasium at Fermoy has proved very useful in developing the muscular power of the soldiers. That at Cahir is reported to be but seldom used. It is proposed that gymnasia be erected at other stations in the district. The want of an hospital, for the treatment of soldiers suffering from contagious diseases at Cork, has been much felt, and I considered it necessary to represent the matter to the military authorities. It has been directed that such an hospital should be included in the estimates for the next year.

The erection of an hospital at Cork, for the treatment of women and children suffering from contagious disease, has been sanctioned, and it would be most desirable that, at all the larger stations, a similar provision should be made.

The barracks, most in want of improved ventilation, are those at Michelstown, Kinsale, Dungarvan, and Fermoy.

The following sanitary improvements have been effected in the district during the year:—

Fethard.—Ventilation of guard-room improved.

Waterford.—Dry-earth system of latrines introduced. Guard-room in Artillery Barracks enlarged. No. 1 Well in Infantry Barracks deepened.

Ballincollig.—General drainage improved.

Queenstown.—Ventilation of wards improved.

Spike Island—New guard-room provided for officers.

Buttevant.—New ovens and boilers placed in No. 1 Cook-house. Two new pumps are being completed.

Fermoy.—Drains in Old Barracks provided with patent traps.

Section II.

On the Amount of Invaliding.

United Kingdom.

The number of men invalided in 1872 in the whole force in the United Kingdom, and in each of the arms separately, is shown in the following Table:—

	Troops generally.	Household Cavalry.	Dragoon Guards and Dragoons.	Royal Artillery (including the Depôt Brigade.)	Foot Guards.	Infantry Regiments.	Depôts.	Royal Engineers and Departmental Corps.
Strength	99,307	1,200	10,532	15,571	6,181	44,551	7,687	6,846
1872.. Number discharged as Invalids ..	2,581	17	311	513	128	1,057	526	96
1872.. Ratio per 1,000 ..	25·99	14·16	29·53	32·94	20·71	23·72	68·43	14·02
1862-71. Ratio per 1,000	29·87	16·47	27·45	29·43	26·70	27·25	36·36	*16·63

* The average of 5 years, 1867–71, as statistics of the invaliding in the Royal Engineers at an earlier period are not available.

Except in the Foot Guards, in which there was a slight decrease, the proportion of men discharged from the service on medical grounds was greater than during the preceding year in all the arms. In the Depôts it was nearly doubled, and in the Cavalry of the Line the increase amounted to more than half the ratio for 1871; as during the preceding year, the proportion was higher in the Artillery than in any of the other arms except the Depôts. In the Household Cavalry, the Foot Guards, the Infantry Regiments, and the Royal Engineers and Departmental Corps, it was below the average of the previous ten years, but in the Cavalry of the Line, the Artillery, and the Depôts it was above it.

Section III.

On the Number constantly in Hospital of the Troops serving in the United Kingdom.

The proportion per 1,000 of the strength constantly non-effective from sickness, the average sick time to each soldier, and the average duration of the cases, are shown in the following Table, both for the whole force, and for each arm of the service:—

		Troops generally.	Household Cavalry.	Cavalry of the Line.	Royal Artillery.	Foot Guards.	Infantry Regiments.	Depôt Brigade Royal Artillery.	Depôts.
Mean daily sick per 1,000 of the strength	1872 ..	39·34	27·85	41·63	44·05	45·73	34·25	58·23	41·53
	1862-71	43·38	30·94	40·21	45·21	47·63	38·56	50·38	43·47
		Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.
Average sick time to each Man in the course of the Year	1872 ..	14·40	10·19	15·24	16·12	16·74	12·02	21·31	15·20
	1862-71	16·11	11·29	14·64	16·50	17·38	14·07	18·39	15·86
Average duration of the Cases	1872 ..	18·36	16·26	19·62	17·33	23·55	17·94	19·08	16·99
	1862-71	18·13	17·98	18·00	18·31	22·52	18·35	17·51	17·34

United Kingdom.

The proportion constantly sick was slightly above the average of the previous 10 years in the Cavalry of the Line, and considerably above it in the Depôt Brigade Royal Artillery, in which it was also, as usual, greatly higher than in any of the other arms. In all the others it was reduced, the reduction being considerable in the Infantry Regiments and the Household Cavalry, in the latter of which the proportion was greatly lowest.

The average duration of the cases was longest in the Foot Guards, and shortest in the Household Cavalry.

Section IV.

On the Influence of Age on the Mortality of Troops serving in the United Kingdom.

The mortality at the different ages, arranged in quinquennial periods, in the several arms of the service, is shown in the following Table, framed from Abstract No. 3 in the Appendix.

Corps.	Annual Ration of Deaths per 1,000 Living, at the following Ages:—					
	Under 20.	20 and under 25.	25 and under 30.	30 and under 35.	35 and under 40.	40 and upwards.
Household Cavalry	..	5·43	3·13	..	..	..
Cavalry of the Line	2·67	3·98	3·47	9·85	10·47	25·02
Royal Artillery	2·22	4·00	6·42	9·84	23·37	40·91
Foot Guards	·74	8·06	5·45	10·01	21·07	59·22
Infantry Regiments	2·84	5·45	4·43	12·32	17·80	22·22
Depôt and Coast Brigade Royal Artillery, and Depôt Battalions	1·61	8·47	8·48	19·16	22·87	36·61
Ditto, ditto, 1862–71	4·44	7·62	11·29	18·21	21·81	24·13
Average of preceding, exclusive of all Depôts	2·55	5·12	4·70	11·31	18·00	26·59
Ditto, ditto, 1862–71	2·90	5·39	7·06	12·51	17·21	19·95
Civil Male Population { England and Wales ..	7·41	8·42	9·21	10·23	11·63	13·55
Civil Male Population { Healthy Districts ..	5·83	7·30	7·93	8·36	9·00	9·86

The ratio of mortality among the troops, exclusive of those at the Depôts, was reduced at all the ages below 35, but increased at those above it. The decrease between 25 and 30, and the increase above 40 were considerable. As during the preceding year, the proportion of deaths between 25 and 30 was lower than that between 20 and 25. In the Depôts the ratio of mortality was above the average at all the ages except those under 20 and between 25 and 30.

Section V.

On the Recruiting of the Army.

The total number of Recruits examined in 1872, as shown by the Annual Returns, was 28,390, of whom 12,396 were examined at the Head-Quarters of Recruiting Districts, 10,515 at the Regiments and Depôts, and 5,479 by Civil Medical Practitioners.

The total number rejected was 8,990, of whom 8,136 were rejected on primary, and 854 on secondary inspection. The proportion rejected per 1,000 of those examined was, therefore, 317, which is below the average, and less by 15·1 than the proportion in 1871.

The following Table shows the numbers rejected in the several groups, and their ratios per 1,000 exmained:—

United Kingdom.

	Number of Recruits Primarily Inspected.	Number Rejected.			Ratio of Rejections per 1,000 Examined.	
		On Primary Inspection.	On Secondary Inspection.	Total.	Primary Inspections.	Primary and Secondary Inspections.
At Head-Quarters of Recruiting Districts	12,396	4,029	279	7,300	325·92	318·62
At Regiments and Depôts	10,515	2,992			284·55	
By Civil Medical Practitioners ..	5,479	1,115	575	1,690	203·50	308·45
Total	28,390	8,136	854	8,990	286·58	316·66

There was a decrease in the proportion rejected on primary inspection in all, and in that rejected on both primary and secondary inspection at the Head-Quarters of Districts and the Regiments and Depôts, but an increase in the total propcrtion rejected of those examined by Civil Medical Practitioners.

Of the recruits found fit for service on primary inspection by Military Medical Officers, the proportion subsequently rejected on secondary inspection was 17·6 per 1,000; but of those passed on primary inspection by Civil Medical Practitioners the proportion so rejected was 131·8 per 1,000. The corresponding ratios for 1871 were 21·9 and 114·6. In the following Table, framed from Abstract No. 4 in the Appendix, the number of recruits who underwent primary and secondary inspection during the year at the Head-Quarters of each of the Recruiting Districts, and the number rejected at each, are shown in detail:—

Districts.	Total Number Inspected.		Ratio found Unfit per 1,000 Inspected.	
	Primary Inspections.	Secondary Inspections.	Primary Inspections.	Secondary Inspections.
London	6,563	1,287	318	93
Portsmouth	230	361	365	141
Devonport	215	342	247	56
Bristol	560	333	332	117
Birmingham	845	145	314	231
Peterborough	47	421	213	57
Manchester	812	54	399	296
Liverpool	980	102	326	206
York	112	430	312	135
Glasgow	799	102	384	127
Edinburgh	329	47	274	43
Inverness	19	12	211	..
Dublin	885	457	296	61
Total	12,396	4,393	325	112
Ratio in 1871	..	..	335	107

Taking the whole together, the proportion rejected on primary inspection was 10 per 1,000 below the ratio for 1871, but exactly the same as that for 1870; that rejected on secondary inspection was 5 per 1,000 above the ratio for 1871. Manchester, Glasgow, Portsmouth, and Bristol furnished the highest ratio of rejections on primary inspection, and Manchester and Birmingham the highest on secondary inspection. The lowest ratio of rejections on both primary and secondary inspection was at Inverness. At London, where more than half the primary inspections took place, the ratio of rejections was, as during the preceding year, below the average.

United Kingdom.

The native countries of the recruits, and the proportion of those from each country found unfit for military service, are shown in the following Table :—

Native Countries of Recruits.	Head-Quarters of Recruiting Districts.		Head-Quarters of Regiments and Depôts.		By Civil Medical Practitioners.		Subsequently Rejected on Secondary Inspection.		Total.		Proportion Rejected per 1,000 Inspected.
	Inspected.	Rejected.	Inspected.	Rejected.	Inspected.	Rejected.	Of those who had been found fit by Army Surgeons.	Of those who had been found fit by Civilians.	Primarily Inspected.	Rejected at Primary and Secondary Inspections.	
England	9,242	3,123	7,960	2,323	4,821	1,005	217	466	22,223	7,134	321·02
Wales	179	52	760	227	117	28	1	19	1,056	327	309·66
Scotland	1,063	350	1,622	408	177	32	21	48	2,862	859	300·14
Ireland	1,629	484	76	17	351	49	39	39	2,056	628	305·45
British Colonies and Foreign Countries ...	83	20	97	17	13	1	1	3	193	42	217·62
Total ...	12,396	4,029	10,515	2,992	5,479	1,115	279	575	28,390	8,990	316·66

Compared with the results for the previous year there was a reduction in the ratio of rejections in all.

The proportion per 1,000 recruits inspected furnished by each of the countries, was as follows :—

England and Wales	820·0	
Scotland	100·8	Total.
Ireland	72·4	1000·0
Colonies and Foreign Countries	6·8	

The proportion furnished by England and Wales was greater than during the preceding year, but exactly the same as in 1870. In that furnished by Scotland there was an increase of 18·4, and in that furnished by Ireland a decrease of 47·3. In the proportion from the Colonies and Foreign Countries there was scarcely any change.

The following Table shows the number of recruits inspected for each arm of the service, and the number rejected as unfit :—

	Head-Quarters of Recruiting Districts.		Regiments and Depôts.		Inspected by Civil Medical Practitioners.		Total Primary Inspections.		Rejected on Secondary Inspection.	Total.		Ratio of Rejections per 1,000 Recruits Inspected.
	Inspected.	Rejected.	Inspected.	Rejected.	Inspected.	Rejected.	Inspected.	Rejected.		Inspected.	Rejected.	
Enlisted for—												
Household Cavalry	...	...	209	95	...	...	209	95	6	209	101	483·25
Cavalry of the Line ...	2,059	636	782	223	283	44	3,124	903	86	3,124	989	316·58
Royal Artillery and Engineers	2,061	639	3,856	967	836	109	6,753	1,715	91	6,753	1,806	267·44
Foot Guards	98	33	214	70	624	179	936	282	203	936	485	518·16
Infantry Regiments and Depôts	2,230	641	4,848	1,460	2,321	309	9,399	2,410	249	9,399	2,659	282·90
General Service	5,948	2,080	606	177	1,415	474	7,969	2,731	219	7,969	2,950	370·18
Total	12,396	4,029	10,515	2,992	5,479	1,115	28,390	8,136	854	28,390	8,990	316·66

Compared with the results for 1871 there was a large increase in the proportion of rejections in recruits for the Foot Guards and the Cavalry of the Line, but a lower ratio of rejections in those for all the other arms. The ratio in the Household Cavalry and the Foot Guards much exceeded that in any of the other arms.

The effect of the different classes of disabilities in causing rejection on primary and secondary inspection, is shown in the following Table :—

RETURN showing the Number of Recruits Rejected during the Year 1872, with the Causes arranged in Classes, and the Ratio per 1,000 in each Class.

Class.	Causes of Rejection, in Classes.	Primary Inspections.								Rejected on Secondary Inspection.		Total Rejected on both Primary and Secondary Inspection.					
		At Head-Quarters of Recruiting Districts.		At Head-Quarters of Regiments & Depôts.		By Civil Medical Practitioners.		Total.				Of Recruits examined by Army Medical Officers.		Of Recruits examined by Civil Medical Practitioners.		Total.	
		12,396		10,515		5,479		28,390				22,911		5,479		28,390	
		Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.	Of Recruits previously examined by Army Medical Officers.	Of Recruits previously examined by Civilians.	Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.
1	Syphilis	172	13·87	155	14·74	72	13·14	399	14·05	16	30	343	14·97	102	18·62	445	15·67
2	Scrofula	45	3·63	59	5·61	18	3·28	122	4·30	4	6	108	4·71	24	4·38	132	4·65
3	Phthisis	60	4·84	60	5·71	41	7·48	161	5·67	9	9	129	5·63	50	9·13	179	6·30
4	Impaired Constitution	128	10·33	64	6·09	21	3·83	213	7·50	10	14	202	8·82	35	6·39	237	8·35
5	Muscular Tenuity and Debility	925	74·62	407	38·71	58	10·59	1,390	48·96	37	64	1,369	59·75	122	22·27	1,491	52·52
6	Other General Diseases	29	2·34	58	5·52	15	2·74	102	3·59	7	11	94	4·10	26	4·75	120	4·23
7	Diseases of Nervous System	13	1·05	14	1·33	7	1·28	34	1·20	4	2	31	1·35	9	1·64	40	1·41
8	Weakness of Intellect	11	·89	19	1·81	1	·18	31	1·09	2	2	32	1·40	3	·55	35	1·23
9	Diseases of Eyes and Eyelids	638	51·47	409	38·90	134	24·46	1,181	41·60	42	70	1,089	47·53	204	37·23	1,293	45·54
10	Diseases of Nose and Mouth	20	1·61	12	1·14	8	1·46	40	1·41	..	4	32	1·40	12	2·19	44	1·55
11	Disease of Ears	32	2·58	2	·19	1	·18	35	1·23	1	1	35	1·53	2	·36	37	1·30
12	Deafness	24	1·94	5	·47	3	·55	32	1·13	1	1	30	1·31	4	·73	34	1·20
13	Impediment of Speech	15	1·21	12	1·14	3	·55	30	1·06	4	3	31	1·35	6	1·10	37	1·30
14	Disease of Heart	202	16·30	327	31·10	86	15·70	615	21·66	27	59	556	24·27	145	26·47	701	24·69
15	Disease of Arteries (Aneurism)	2	·16	6	·57	2	·36	10	·35	1	..	9	·39	2	·36	11	·39
16	Disease of Veins (Varix)	208	16·78	207	19·69	112	20·44	527	18·56	11	29	426	18·59	141	25·73	567	19·97
17	Disease of Lungs (except Phthisis)	30	2·42	39	3·71	13	2·37	82	2·89	4	7	73	3·19	20	3·65	93	3·28
18	Loss or Decay of many Teeth	129	10·41	69	6·56	15	2·74	213	7·50	4	12	202	8·82	27	4·93	229	8·07
19	Hernia	226	18·23	121	11·51	87	15·88	434	15·29	20	40	367	16·02	127	23·18	494	17·40
20	Laxity of Abdominal Rings	91	7·34	45	4·28	19	3·47	155	5·46	4	14	140	6·11	33	6·02	173	6·09

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RETURN—*continued.*

Class	Causes of Rejection, in Classes.	Primary Inspections.								Rejected on Secondary Inspection.		Total Rejected on both Primary and Secondary Inspection.					
		At Head-Quarters of Recruiting Districts.		At Head-Quarters of Regiments & Depôts.		By Civil Medical Practitioners.		Total.				Of Recruits examined by Army Medical Officers.		Of Recruits examined by Civil Medical Practitioners.		Total.	
		12,396		10,515		5,479		28,390				22,911		5,479		28,390	
		Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.	Of Recruits previously examined by Army Medical Officers.	Of Recruits previously examined by Civilians.	Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.
21	Hæmorrhoids	43	3·47	6	·57	5	·91	54	1·90	2	2	51	2·23	7	1·28	58	2·04
22	Diseases of the Urinary Organs	12	·97	6	·57	..	..	18	·64	1	3	19	·83	3	·55	22	·78
23	Varicocele	202	16·30	152	14·45	131	23·91	485	17·08	15	36	369	16·11	167	30·48	536	18·88
24	Other Diseases of the Genital Organs (not Syphilitic)..	23	1·85	16	1·52	13	2·37	52	1·83	1	3	40	1·75	16	2·92	56	1·97
25	Defects of Upper Extremities, from Fracture, Contraction, Luxation, &c. ..	113	9·11	81	7·70	14	2·55	208	7·33	5	15	199	8·68	29	5·29	228	8·03
26	Defects of Lower Extremities, from Fracture, Contraction, Luxation, &c. ..	164	13·23	132	12·55	47	8·58	343	12·08	15	48	311	13·57	95	17·34	406	14·30
27	Flat Feet	26	2·10	109	10·37	34	6·21	169	5·95	5	15	140	6·11	49	8·94	189	6·66
28	Diseases of Joints	13	1·05	27	2·57	8	1·46	48	1·69	1	6	41	1·79	14	2·56	55	1·94
29	Other Affections of Bones and Muscles ..	23	1·85	53	5·04	5	·91	81	2·85	4	5	80	3·49	10	1·83	90	3·17
30	Ulcers, Wounds, and Cicatrices	55	4·44	41	3·90	28	5·11	124	4·37	3	8	99	4·32	36	6·57	135	4·75
31	Other Affections of the Cutaneous System.	67	5·40	30	2·85	27	4·93	124	4·37	5	10	102	4·45	37	6·75	139	4·90
32	Malformation of Ears	..	..	3	·29	..	..	3	·11	..	..	3	·13	..	..	3	·11
33	„ Nose and Mouth.. ..	3	·24	2	·19	..	..	5	·18	..	1	5	·22	1	·18	6	·21
34	„ Chest and Spine	193	15·57	196	18·64	82	14·97	471	16·59	8	34	397	17·33	116	21·17	513	18·07
35	„ Urinary or Genital Organs	6	·48	2	·19	..	..	8	·28	..	1	8	·35	1	·18	9	·32
36	Marks of Punishment, or of letter D or B C	12	·97	9	·85	..	..	21	·74	1	2	22	·96	2	·36	24	·85
37	Marks of Cupping, Blistering, &c... ..	74	5·97	37	3·52	5	·91	116	4·09	5	8	116	5·06	13	2·37	129	4·54
	Total Rejected	4029	325·02	2992	284·55	1115	203·50	8,116	286·38	279	575	7,300	318·62	1690	308·45	8,990	316·66

United Kingdom.

The general results shown by this Table, compared with that for 1871, are an increase in the ratio of rejections for phthisis, muscular tenuity, varicose veins, and hernia, and a reduction in that for scrofula, diseases of the heart, lungs, and teeth, defects of the lower extremities from fracture, &c., and malformations of the chest and spine. In the other classes the changes were comparatively slight. The most frequent causes of rejection, arranged according to the ratio of rejections from each, were muscular tenuity and debility, diseases of the eyes and eyelids, diseases of the heart, varicose veins, varicocele, malformations of the chest and spine, hernia, syphilis, and defects of the lower extremities.

The most noteworthy change shown by the Table is the increase in the ratio of rejections for muscular tenuity and debility, which in 1871 was much above the the average of former years, and is now nearly double that average. The increase took place chiefly in the rejections on primary inspection, and was greatest at the Head-Quarters of Districts, where the proportion rejected from this cause alone was 74·62 per 1,000 inspected. At the Regiments and Depôts the ratio was 38·71, which is considerably lower than it was in 1871, and at the stations where the inspection was made by Civil Medical Practitioners it was 10·59, which is higher. As during the preceding year, the greatest difference between the results of the examination of recruits by Military Medical Officers and that by Civil Medical Practitioners was observed in this class of disabilities. In the following classes also the proportion of recruits examined by Military Medical Officers, who were rejected on both primary and secondary examination, was higher than that of those examined by Civil Medical Practitioners:—impared constitution, weakness of intellect, diseases of eyes and eyelids, loss or decay of many teeth, defects of upper extremities, affections of bones and muscles, and marks of previous medical treatment. The proportion was lower in syphilis, phthisis, diseases of the heart, varicose veins, hernia, varicocele, defects of the extremities, and malformations of the spine. In primary inspections alone the proportion of rejections by Army Medical Officers was higher than that by Civil Medical Practitioners for scrofula, impaired constitution, muscular tenuity, weakness of intellect, diseases of the eyes, ears, heart, lungs and teeth, laxity of abdominal rings, hæmorrhoids, defects of upper and lower extremities, marks of punishment and marks of previous medical treatment, and lower for varicose veins, varicocele, diseases of genital organs, ulcers, wounds, and cicatrices.

The ages of recruits enlisted are shown in Abstract No. 6 in the Appendix, from which the following Table has been framed:—

Proportion in 10,000 Examined.	Boys under 17.	17 to 18.	18 to 19.	19 to 20.	20 to 21.	21 to 22.	22 to 23.	23 to 24.	24 to 25.	25 and upwards.
At Head-Quarters of Recruiting Districts ..	282	285	3,046	2,077	1,458	981	703	535	514	119
At Regiments and Depôts ..	360	598	2,455	2,609	1,432	893	680	516	370	87
By Civil Medical Practitioners	71	93	2,871	2,708	1,615	889	683	535	484	51
Total ..	270	364	2,793	2,396	1,479	931	690	528	455	94

Compared with the results for 1871, there was a large increase in the proportion of boys under 17, but a greater decrease in those between 17 and 18, a moderate increase between 18 and 19, and a moderate decrease between 19 and 20. At the other ages the differences were not very considerable. Dividing the recruits into those under and those over 20 years of age, the proportion of the former per 10,000 enlisted was 5,823, and that of the latter 4,177. The corresponding ratios for 1871 were 5,760 and 4,240. The difference between the ratios for the two years does not exceed the amount of fluctuation to be looked for from year to year, and as the ages as to which the statements of

United Kingdom.

the recruits (from which the returns are compiled) are least reliable, are either considerably above or considerably below 20, the numbers may be accepted as accurate. It is impossible to feel the same assurance as to the perfect accuracy of the numbers at each particular age at either end of the scale.

The proportion of recruits at each height in every 10,000 examined is shown in the following Table, calculated from Abstract No. 8 in the Appendix :—

Proportion in 10,000.	Inspected at Head-Quarters of Recruiting Districts.	Inspected at Regiments and Depôts.	Inspected by Civil Medical Practitioners.	Total.
Ft. In. Ft. In.				
Under 5 3 ..	274	303	60	243
5 3 to 5 4 ..	58	263	37	130
5 4 „ 5 5 ..	775	1,737	496	1,078
5 5 „ 5 6 ..	3,454	2,519	2,988	3,018
5 6 „ 5 7 ..	2,342	1,857	2,325	2,159
5 7 „ 5 8 ..	1,451	1,480	1,800	1,529
5 8 „ 5 9 ..	827	844	1,217	908
5 9 „ 5 10 ..	460	477	664	506
5 10 „ 5 11 ..	208	234	252	226
5 11 „ 6 0 ..	103	147	97	118
6 0 and upwards	48	139	64	85
Total	10,000	10,000	10,000	10,000

Compared with the results for the preceding year, this Table shows a much higher proportion of recruits under 5 feet 3 inches, and from 5 feet 3 to 5 feet 4, the result, no doubt, of the increased proportion of boys enlisted, particularly at the Regiments and Depôts where the greater part of the increase at the latter age took place ; a decrease in the proportion between 5 feet 4 and 5 feet 5 ; an increase in that between 5 feet 5 and 5 feet 6 ; little change at the next five heights ; and a considerable increase in the proportion over 6 feet.

The weights of the recruits inspected at the Head-Quarters of the Recruiting Districts are shown in Abstract No. 9 in the Appendix, from which, and the Regimental Returns, the following Table has been framed :—

Proportion in 10,000 Examined.	Primary Inspections.	
	At Head-Quarters of Regiments and Depôts.	At Head-Quarters of Recruiting Districts.
lbs. lbs.		
Under 100	330	287
From 100 to 110	40	261
„ 110 to 120	700	1,812
„ 120 to 130	1,913	3,405
„ 130 to 140	3,086	2,384
„ 140 to 150	2,441	1,219
„ 150 to 160	932	447
„ 160 to 170	390	145
„ 170 and upwards	168	40
Total	10,000	10,000

The results shown by this Table indicate a continuance of the superiority of the recruits enlisted at the Regiments and Depôts over those enlisted at the

Recruiting Districts, as to physical development, which was noted in the Report for 1871. The proportion under 100 lbs. was greater at the former, obviously from the greater number of boys included among the regimental recruits, but at the next three weights the proportion was much greater at the Head-Quarters of Districts, and at all the weights above 130 lbs. the advantage was greatly on the side of the Regiments and Depôts. The proportion per 10,000 above that weight was 7,017 at the Regiments and Depôts, and 4,235 at the Head-Quarters of Districts. The corresponding ratios in 1871 were 7,562 and 4,341. This indicates a slight falling off in the quality of the recruits of both classes.

The state of education among recruits is shown in the following Table, framed from Abstract No. 7 in the Appendix. There is no information available on this head respecting those examined by Civil Medical Practitioners:—

	Unable to Read.	Able to Read only.	Able to Read and Write.
At Head-Quarters of Recruiting Districts..	1,655	1,744	8,997
At Head-Quarters of Regiments and Depôts	1,608	1,037	7,870
Total..	3,263	2,781	16,867
Ratio per 1,000 *examined.*			
At Head-Quarters of Recruiting Districts..	133·5	140·7	725·8
At Head-Quarters of Regiments and Depôts	152·9	98·6	748·5
Total..	142·5	121·3	736·2

The proportion totally uneducated was almost the same as in 1871, an increase at the Regiments and Depôts being counterbalanced by a decrease in the Districts. The proportion able to read only was twice as great as in 1871 at the Head-Quarters of Districts, but considerably lower at the Regiments and Depôts, the general result being a considerable increase. That able to read and write was reduced at the Head-Quarters of Districts, but increased at the Regiments and Depôts to a nearly equivalent extent. On the whole, the state of education of the recruits was rather above the average of previous years.

The occupations of recruits previously to enlistment, and the proportion of rejections in each group, are shown in the following Table:—

Occupations of Recruits.	Number Inspected.	Rejected on Primary Inspection.	Rejected on Secondary Inspection.	Total Rejected.	Ratio per 1,000 Rejected.
1. Labourers, Husbandmen, and Servants	17,497	5,030	545	5,575	318·6
2. Manufacturing Artisans (as Clothworkers, Weavers, Lace Makers, &c.)	2,488	739	86	825	331·6
3. Mechanics employed in Occupations favourable to physical development (as Carpenters, Smiths, Masons, &c.)	5,603	1,689	167	1,856	331·3
4. Shopmen and Clerks	1,862	532	47	579	310·9
5. Professional Occupations, Students, &c.	234	63	6	69	294·9
6. Boys	706	83	3	86	121·8
Total	28,390	8,136	854	8,990	316·7

United Kingdom.

The proportion of rejections was lower than in 1871 in all the groups except that of "Mechanics employed in occupations favourable to development," and Boys. As during the two preceding years, it was highest in the group of Manufacturing Artisans, though in that of Mechanics it was only lower by ·3.

The proportion per 1,000 of recruits furnished by each group of occupations was as follows:—

1. Labourers, Husbandmen, and Servants	616·3
2. Manufacturing Artizans (as Clothworkers, Weavers, Lace-makers, &c.)	87·6
3. Mechanics employed in occupations favourable to physical development (as Carpenters, Smiths, Masons, &c.) ..	197·4
4. Shopmen and Clerks	65·6
5. Professional occupations, Students, &c.	8·2
6. Boys	24·9
Total	1,000

Compared with the results for 1871, there was a decrease in the proportion of Labourers, but it did not fall below the average of previous years, and they still formed nearly two-thirds of the whole of the recruits enlisted. There was an increase in the proportion of Manufacturing Artizans, Mechanics, Students and Boys, and a decrease in that of Shopmen and Clerks.

II.—ON THE HEALTH OF THE TROOPS SERVING IN THE MEDITERRANEAN

Section I.—Sickness and Mortality.

I.—Gibraltar.

STATISTICAL REPORT.

Gibraltar.

Several changes took place in the corps forming the garrison during the year. The 1st Battalion of the 13th, and the 74th and 28th Regiments, embarked for Malta in February and the beginning of March, and the 1st Battalion of the 24th, and the 31st, arrived from that station on the 5th of the latter month. The average strength during the year was 4,066; the admissions into hospital were 2,595; and the deaths, including 4 which took place out of hospital, and 2 of invalids at Netley, amounted to 21. The ratios per 1,000 of the strength represented by these numbers are, for admissions 638·2, and for deaths 5·16, which are lower than those for 1871, and below the average of the previous ten years, that of deaths considerably so.

The following Table shows the admissions and deaths in the several corps forming the garrison:—

Corps.	Average Annual Strength.	Admitted into Hospital.	Died.				Ratio per 1,000 of Strength.	
			In Hospital.	Out of Hospital.	Of Invalids.	Total.	Admitted.	Died.
Royal Artillery	958	680	7	1	1	9	710	9·39
Royal Engineers	274	170	..	..	..	..	620	..
1st Battalion 13th Regiment ..	68	18	..	1	..	1	265	14·71
1st „ 24th „ ..	533	301	..	..	..	..	565	..
28th Regiment	116	52	..	..	..	..	448	..
31st „	561	408	2	1	..	3	727	5·35
71st „	670	415	3	1	..	4	619	5·97
74th „	130	49	..	..	..	..	377	..
81st „	653	466	3	..	1	4	714	6·13

In the Royal Engineers, in which the ratio of mortality was highest during each of the four previous years, there were no deaths. The ratio of admissions was highest in the 31st and 81st Regiments, and, after them, in the Royal Artillery, but in all it was lower than during the previous year. *Gibraltar.*

The following summary, framed from Abstract No. 10 in the Appendix, shows the classes and orders of diseases by which the sickness and mortality were caused:—

Orders.	Diseases.	1872. Average Strength, 4,066.						1869-71.		1872. Infantry at Home.	
		Admitted into Hospital.	Deaths. At Gibraltar.	Deaths. Of Invalids.	Deaths. Total.	Annual ratio per 1,000 of Strength. Admitted.	Annual ratio per 1,000 of Strength. Died.	Annual ratio per 1,000 of Strength. Admitted.	Annual ratio per 1,000 of Strength. Died.	Annual ratio per 1,000 of Strength. Admitted.	Annual ratio per 1,000 of Strength. Died.
	I. *General Diseases.*										
1	Febrile Group ..	339	3	..	3	83·4	·74	78·6	1·34	41·7	·76
2	Constitutional „ ..	490	5	1	6	120·5	1·47	110·8	1·56	124·9	2·74
	II. *Local Diseases.* Diseases of the—										
1	Nervous System ..	29	2	..	2	7·1	·49	8·5	·30	9·0	·38
2	Eye	59	..	..	..	14·5	..	21·6	..	17·6	..
3	Ear	18	..	..	..	4·4	..	4·2	..	3·3	..
4	Nose	4	..	..	..	1·0	..	·5	..	·3	..
5	Circulatory System ..	41	4	..	4	10·1	·98	10·6	1·04	13·2	·94
6	Absorbent „ ..	19	..	..	..	4·7	..	4·1	..	10·8	..
7	Ductless Glands ..	..	..	..	..	..	..	·1	..		·02
8	Respiratory System ..	168	2	1	3	41·3	·74	40·7	·74	68·6	1·08
9	Digestive „ ..	274	..	..	..	67·4	..	85·1	·07	79·2	·56
10	Urinary „ ..	344	..	..	..	84·6	..	78·8	·45	100·5	·20
11	Generative „ ..	50	..	..	..	12·3	..	16·4	..	9·0	..
12	Organs of Locomotion	22	..	..	..	5·4	..	5·5	·07	4·8	..
13	Cellular Tissue ..	56	..	..	..	13·8	..	12·6	..	17·4	·05
14	Cutaneous System ..	268	..	..	..	65·9	..	76·4	..	83·4	..
	III. *Conditions, &c.*										
	Debility	13	..	..	..	3·2	..	5·5	..	4·0	..
	IV. *Poisons* ..	9	..	..	..	2·2	..	10·7	·15	1·9	·14
	V. *Injuries.*										
2	Accidental	389	2	..	2	95·7	·49	86·5	·30	79·3	·49
3	Homicidal	..	..	..	..	..	..	..	..	..	·02
4	Self-inflicted	1	1	..	1	·2	·25	·1	·37	·2	·14
5	Judicial	..	..	..	..	..	..	·1	..	..	·82
	VI. *Surgical Operations*	..	..	..	..	..	..	·1	..	·2	..
	No appreciable Disease	2	..	..	..	·5	..	·3	..	·6	..
	Total	2,595	19	2	21	638·2	5·16	657·8	6·39	669·9	7·54
	Average of 10 Years 1862-71	..	..	..	..	715·4	8·14	..	..	..	..

GENERAL DISEASES were more prevalent, but less fatal than during the previous year, the increase of prevalence being confined to the constitutional, and the reduction of mortality to the febrile group. The mortality from the

Gibraltar. constitutional group was higher than in 1871, though below the average of the preceding ten years.

The admissions and deaths from the principal diseases of this class are shown in the following Table :—

General Diseases.	Admitted.	Died.	Annual ratio per 1,000. 1872. Admitted.	1872. Died.	1869-71. Admitted.	1869-71. Died.
Febrile—						
Eruptive Fevers	23	..	5·7	..	3·0	·07
Continued „	253	3	62·2	·74	63·7	1·19
Paroxysmal „	42	..	10·3	..	8·5	·07
Influenza	10	..	2·5	..	1·5	..
Erysipelas	6	..	1·5	..	1·4	..
Other diseases of this group	5	..	1·2	..	·5	..
Total of Febrile Group	339	3	83·4	·74	78·6	1·33
Constitutional—						
Rheumatism	152	..	37·4	..	38·9	·07
Syphilis	301	..	74·0	..	60·0	·07
Scrofula, Phthisis, &c.	28	5	6·9	1·22	9·5	1·34
Scurvy and Purpura	..	..	..	..	·3	..
Anæmia	4	..	1·0	..	1·6	..
Other diseases of this group	5	1	1·2	·25	·5	·07
Total of Constitutional Group	490	6	120·5	1·47	110·8	1·55

The ratio of prevalence of eruptive fevers was almost identical with that for 1871, but much above the average of the three previous years. The excess was due almost entirely to the prevalence of measles, chiefly in the Royal Artillery and the 1st Battalion 24th Regiment, that disease having broken out among the children of the latter corps, and those of the 31st Regiment, on the voyage from Malta in the transport "Jumna," in the beginning of March, and prevailed epidemically at Gibraltar till the end of June. During that period 246 admissions and 8 deaths were caused by it among the children at the station. One man of the Royal Engineers was admitted with scarlet fever in April, and that disease also prevailed to some extent among the children, the returns for the Royal Artillery and the 31st Regiment showing 17 admissions from it, but no deaths. It did not extend to the other corps, or spread farther among the men.

Continued Fevers were rather less prevalent, and considerably less fatal than during the previous year. All the deaths (three in number) were from enteric fever, from which there were 11 admissions. All the fatal cases occurred in the Royal Artillery, two of them being admitted from the "Wellington Front" and one from the "Town Range" Barracks. The disease is believed to have been contracted in the town.

Erysipelas prevailed to almost the same extent as during the previous three years.

Rheumatism was less prevalent than in 1871, and rather below the average of previous years.

Syphilis was greatly more prevalent, the ratio of admissions from it being more than double that for 1871, though scarcely equal to the average for 1869-70. The ratio for 1871 was exceptionally low. The Principal Medical Officer attributes the increase, and a corresponding increase in the gonorrhœal group of venereal diseases, first, to the frequent visits of squadrons

of iron-clad vessels fitted only for short cruises, their crews being always allowed leave on shore, and on every visit bringing a fresh supply of venereal virus; and, secondly, to the imperfect manner in which the "contagious diseases" ordinance is carried out, its provisions being made applicable only to "aliens;" and natives, among whom these diseases chiefly exist, escaping its operation altogether.

The admissions from *scrofula* and *phthisis*, were much less numerous than during the previous year, and much below the average, but the ratio of deaths from them was nearly three times as high as in 1871, though not above the average of previous years.

LOCAL DISEASES.—Affections of the *digestive*, *generative*, and *cutaneous* systems were less prevalent than in 1871, and below the average of previous years. In the other orders there was little change. The increased prevalence of diseases of the urinary system noticed last year continues, and, as then, is attributable to a high ratio of admissions for gonorrhœa, most marked in the Artillery.

INJURIES.—The admissions for accidental injuries were considerably less numerous than in 1871, though above the average of previous years. Only two accidents proved fatal during the year. A gunner of the Royal Artillery was killed by falling over a precipice at Catalan Bay, and a private of the 71st Regiment by a fall from the third floor of the South Barracks.

There was one case of suicide, by cut throat, in the 1st Battalion of the 13th Regiment.

SANITARY REPORT.

Deputy Inspector-General Bent makes the following remarks in his sanitary report:—

The reports of all the Regimental Medical Officers concur in representing the health of the troops as exceptionally good for the past year, an advantage that has, in the main, been due to the increased accommodation that has been gained by the reduction of one regiment in the garrison for nearly the whole period, and also to the more general adoption, on medical recommendation, of straw hats for the large working parties employed on the public works.

Attention, however, is drawn to two forms of disease which are still needlessly productive of admissions into hospital; one being febricula, from solar influence, and the other venereal, from the imperfect application of the Contagious Diseases Act to the station.

Dr. Bent states that, although eight hours of continuous quarrying, or building labour, in unsheltered situations is trying to many men in the hot months, it would be difficult to divide the day better, and working by relays would involve a greater risk, from the extra march in the sun to and from the barracks. The arrangement of the meals is open to objection, and might be avoided by an extra ration of meat and bread, carried cooked to the place of labour, and eaten as lunch between 11 and 12 A.M., when there is always a short suspension of work.

The dinner, which awaits the working parties on their return to barracks, might also be prepared fresh for them, independently of the regular barrack-room dinner, but for this probably an extra allowance of fuel would be required.

The second cause, reported as affecting the health of the troops, is the restriction of the local ordinance for the periodical inspection of prostitutes to those of alien origin, and the virtual exemption of natives from police supervision. The mischief of this distinction is evident, when it is remembered that two or three infected women at large are sufficient to spread the disease through a regiment, and it is proved by the fact that of 2,595 admissions into hospital for the year under review, 612 were from venereal, whereas in Malta, and formerly in Corfu, where every habitual prostitute was registered and under health inspection, syphilis has been extinguished for long periods together. The necessity of stricter measures being taken has greatly increased

Gibraltar. since Gibraltar has become the constant resort of the ironclad squadrons, with the frequent presence ashore of many hundreds of sailors on leave.

The chief sanitary defects are:—1. Continued insufficiency of water in all barracks, except where the north front water is laid on. 2. Imperfect means of ablution. 3. Inadequate fuel for winter. 4. Want of fire-places in some rooms, and, 5. The continuance of stone pavements instead of plank floors in many.

1. Since last year's report, no further steps have been taken to connect more barracks with the Sanitary Commissioners mains, though the measure has lately been commenced at the Naval Hospital. At Europa, Windmill Hill, and the South Barracks, water is still carted by the Control, at great expense of money and labour, from the nearest hydrants, whenever the tanks fail, *i.e.*, for a portion of nearly every summer, and as often as they become polluted by bursting drains or fouling roofs; whereas a few yards of piping would provide an inexhaustible supply at all seasons, and safe from defilement.

2. Excepting the Grand Casemates, none of the barracks can be said to be properly equipped with ablution conveniences. The Wellington Front, South Barracks, and others, are without baths; and at Buena Vista and the Defensible respectively, there is only one. In view of the water difficulty, and the impossibility of utilising large immersion baths, the issue of a number of foot-pans to each barrack, in the proportion of one to every 25 men, is proposed. It is found that men will use these, when they will not take the trouble to fill and empty a large bath; and if a screen or two were added to every lavatory, the former would doubtless be constantly employed for private ablution. At present, the Grand Casemates is believed to be the only barrack with foot-pans, but at small cost they might be supplied to the whole, and all the needs of health and cleanliness be sufficiently met.

3. Although the climate of Gibraltar may be considered a warm one, it is so only during three-quarters of the year, and from November to February the weather is generally cold and wet enough to require fires for the whole of the period. In some of the barracks only is coal issued, and then but in insufficient quantities,—*e.g.*, 160 lbs. weekly for each hut for 6 weeks; in others, as at Windmill Hill, a very exposed quarter, there is none.

Dr. Bent recommends this allowance to be doubled, and that—

4. Fireplaces be constructed in all rooms where, as in the Town Range and at Windmill Hill, the nature of the building admits of it.

5. The stone pavement which remains in several of the older barracks is also objectionable, on account of the cold and damp in winter, and this should be replaced, wherever practicable, by plank flooring.

At Windmill Hill, where there are two latrines in the old barrack, one has been altered within the year on Jennings' principle, but the other, at the south end, is also reported as offensive, and requires the same change; while in those at the officers' quarters the complaints against the cesspit system are constant and well-founded. Water-closets, for which the situation affords every facility, should be substituted without delay.

In the South Barracks, where the upper story only is ventilated through the roof, the defective ventilation of the lower rooms has been lately improved by perforated zinc plates, one pane being removed in each window; but this has not proved sufficient, and a second pane should be similarly converted.

Subjoined is a return of the different sanitary improvements, executed by the Royal Engineers during the year, to which may be added the completion of a large and excellent gymnasium between Buena Vista and Europa. Of this it is needless to say more than that it completely answers its end, being largely resorted to by the men, and with the best effects upon their physical development, according to the statement of the Medical Officers who have reported upon it. It has, however, been too recently established for its full value to be demonstrated.

STATEMENT of Sanitary Services performed by the Royal Engineer Department during the year 1872. *Gibraltar.*

No. of Item.	Services.
1	Built new cells—Rosia Guard Room.
2	Ventilated cook-house—Moorish Castle.
3	Built new urinal—Jumper's Bastion.
4	F. O. Qrs. 38—Converted privies into water-closet.
5	Ventilated tailors' shop—Casemate Barracks.
6	Officers' mess, South Barracks—Converted privies into water-closet.
7	South Barracks—Provided gratings in wash-houses for standing upon.
8	Camp Bay bathing place—Diverted drain.
9	Windmill Hill—Converted privies into Jennings' latrines.
10	Provided a water-closet for No. 4 Officers' Quarters, Southport Street.
11	Commenced laying on fresh water to Naval Hospital from Sanitary Commissioners' mains.
12	No. 4 Officers' Quarters—Converted privy into water-closet.
13	Improved quarters in Naval Hospital for Sick Officers.
14	Ventilated Armourer's shop—Casemate Barracks.
15	Married soldiers' quarters, Crutchett's Ramp—Renewed flooring to privies.

II.—MALTA.

STATISTICAL REPORT.

Malta.

The following changes took place in the corps forming the garrison during the year. The 1st Battalion of the 13th, and the 28th and 74th Regiments, arrived from Gibraltar in January and February, and the 1st Battalion of the 18th Regiment from Ireland in January. The 1st Battalion of the 24th, and the 31st Regiment, embarked for Gibraltar in February and March; the 48th Regiment embarked for India in February; the 64th Regiment embarked for Ireland in March; and the 87th Regiment embarked for Halifax in May.

The average strength during the year, exclusive of the Royal Malta Fencible Artillery, was 4,855. The admissions into hospital amounted to 4,505, and the deaths, including 3 out of hospital, and an equal number of invalids at Netley, to 44. The ratios per 1,000 of the strength represented by these numbers are, for admissions, 928, and for deaths, 9·06; the former being 219 above the ratio for 1871, and 253 above the average for the three years from 1869 to 1871, and the latter 3·20 and 1·61 below the ratios of deaths for those periods.

The admissions and deaths in the several corps were as follows:—

Corps.	Average Annual Strength.	Admitted into Hospital.	Died.				Ratio per 1,000 of Strength.	
			In Hospital.	Out of Hospital.	Of Invalids.	Total.	Admitted.	Died.
Royal Artillery	993	1,046	10	..	..	10	1,048	10·02
Royal Engineers	176	200	..	..	..	..	1,136	..
1st Battalion 13th Regiment ..	573	562	6	..	..	6	981	10·47
1st „ 18th „ ..	612	770	4	1	..	5	1,258	8·17
1st „ 24th „ ..	99	31	1	..	..	1	313	10·10
28th Regiment	551	468	4	1	..	5	849	9·07
31st „	132	42	2	..	..	2	318	15·15
48th „	65	36	1	..	1	2	554	30·77
52nd „	670	565	3	1	1	5	843	7·46
64th „	123	56	..	..	..	..	455	..
74th „	587	508	6	..	..	6	865	10·22
87th „	217	206	1	..	1	2	949	9·22

Malta. Of the corps present during the whole or the greater part of the year, the 1st Battalion of the 18th Regiment shows the highest ratio of admissions, and the 1st Battalion of the 13th the highest ratio of mortality. In almost all the ratio of admissions was greatly higher than in 1871.

The prevalence of the various classes and orders of diseases, and the mortality caused by them, are shown in the following Table, which has been framed from Abstract No. 10 in the Appendix:—

Orders.	Diseases.	1872.—Average Strength, 4,855.						1869–71.	
		Admitted into Hospital.	Deaths.			Annual ratio per 1,000 of Strength.		Annual ratio per 1,000 of Strength.	
			In Malta.	Of Invalids.	Total.	Admitted.	Died.	Admitted.	Died.
	I. *General Diseases.*								
1	Febrile	1,187	19	..	19	244·5	3·91	156·3	2·57
2	Constitutional	495	5	2	7	101·9	1·44	67·2	1·49
	II. *Local Diseases.*								
	Diseases of the—								
1	Nervous System ..	64	1	..	1	13·2	·21	8·6	·74
2	Eye	178	..	..	..	36·7	..	25·1	..
3	Ear	23	..	..	..	4·7	..	2·4	..
4	Nose	3	..	..	..	·6	..	·6	..
5	Circulatory System ..	61	4	1	5	12·6	1·03	7·8	1·49
6	Absorbent „ ..	33	..	..	..	6·8	..	3·6	..
8	Respiratory „ ..	201	4	..	4	41·4	·82	40·7	1·01
9	Digestive „ ..	697	3	..	3	143·6	·61	112·8	1·42
10	Urinary „ ..	253	1	..	1	52·1	·21	32·5	·13
11	Generative „ ..	80	..	..	..	16·5	..	12·4	..
12	Organs of Locomotion..	21	..	..	..	4·3	..	4·5	..
13	Cellular Tissue.. ..	142	1	..	1	29·2	·21	26·2	..
14	Cutaneous System ..	354	..	..	..	72·9	..	63·2	..
	III. *Conditions, &c.* .								
	Debility..	69	..	..	..	14·2	..	4·6	..
	IV. *Poisons* ..	131	..	..	..	27·1	..	10·9	·47
	V. *Injuries.*								
2	Accidental	500	2	..	2	103·0	·41	92·5	·74
3	Homicidal	..	..	..	..	..	..	·2	..
4	Self-inflicted	4	..	..	..	·8	..	·7	·54
5	Judicial..	..	..	..	..	..	..	·1	..
	VI. *Surgical Operations*	2	1	..	1	·4	·21	·2	·07
	No appreciable disease..	7	..	..	..	1·4	..	1·8	..
	Total	4,505	41	3	44	927·9	9·06	674·9	10·67
	Average of 10 Years, 1862–71	..	..	..	..	792·8	13·65	..	..

The ratio of admissions was much above the average of the previous ten years, and higher than that for any year of the ten, except 1865, during which the station was visited by an epidemic of cholera. The ratio of deaths, on the other hand, was considerably below the average, and lower than that for any of the previous ten years, except 1863 and 1864.

The increase of admissions extended over all the more important classes and orders of diseases, but was most marked in General Diseases.

The following Table shows the prevalence of the principal diseases included in that class, and the mortality resulting from them :—

General Diseases.	1872.		Annual Ratio per 1000 of Strength.			
			1872.		1869–71.	
	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Febrile—						
Eruptive Fevers	9	..	1·9	..	5·7	·81
Continued „	1,133	19	233·4	3·91	142·7	1·55
Paroxysmal „	29	..	6·0	..	4·9	·20
Influenza	6	..	1·2	..	·6	..
Erysipelas	6	..	1·2	..	1·4	..
Other diseases of this group	4	..	·8	..	·9	..
Total of Febrile Group.. ..	1,187	19	244·5	3·91	156·2	2·56
Constitutional—						
Rheumatism	246	..	50·7	..	47·4	..
Syphilis	167	..	34·4	..	10·4	..
Scrofula, Phthisis, &c.	68	7	14·0	1·44	7·8	1·22
Scurvy and Purpura	2	..	·4	..	·1	..
Anæmia	8	..	1·6	..	1·0	..
Other diseases of this group	4	..	·8	..	·5	·27
Total of Constitutional Group..	495	7	101·9	1·44	67·2	1·49

Eruptive Fevers were much less prevalent than in 1871, only 9 admissions, and no deaths having resulted from them. All were cases of measles, and all except 2 occurred in the 1st Battalion of the 18th Regiment. The disease prevailed to a considerable extent among the families of the soldiers during the year, 93 attacks and 8 deaths being recorded from it. It was brought to the station by the 18th Regiment, in January.

Continued Fevers were more than twice as prevalent as in 1871, and greatly above the averages of the three years from 1869 to 1871, and the previous decade. The mortality from them also was much above the average.

The admissions and deaths from the several diseases included under this head were as follows :—

Diseases.	Admissions.	Deaths.	Ratio per 1,000 of Strength.	
			Admissions.	Deaths.
Cerebro-Spinal Fever	1	..	·2	..
Enteric Fever	29	10	6·0	2·06
Simple Continued Fever	650	9	133·9	1·85
Febricula	453	..	93·3	..

Their prevalence, and the mortality from them during each of the quarters of the year, are shown in the following Table, compiled from the Quarterly Returns of the Principal Medical Officer, in which 30 admissions and 1 death in the Royal Malta Fencible Artillery are included :—

Malta.

Quarters.	Cerebro-Spinal Fever.		Enteric Fever.		Simple Continued Fever.		Febricula.		Total.	
	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Ist	1	..	4	..	38	1	25	..	68	1
IInd	..	..	5	1	113	2	98	..	216	3
IIIrd	..	..	7	5	367	3	295	..	669	8
IVth	..	..	16	5	153	3	41	..	210	8

In the following Table the admissions and deaths are shown by corps, the barracks occupied by each, and its average strength during the third quarter of the year, when fevers were chiefly prevalent, as well as its average annual strength being also stated:—.

Corps.	Barrack Occupied.	Average Annual Strength.	Average Strength from 30th June to 30th September.	Cerebro-Spinal Fever.		Enteric Fever.		Simple Continued Fever.		Febricula.		Total.	
				Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Royal Artillery	Upper St. Elmo ... Lower St. Elmo till April ... ... Marsamuscetto ... St. James' Cavalier St. Angelo ... ... Fort Ricasoli ... „ Manoel ... St. Clement's Bastion from April ...	998	1,036	..	..	9	5	71	3	32	...	112	8
Royal Engineers	St. Francis Barracks St. Francis Ravelin	176	162	...	...	...	...	6	...	12	...	18	...
1st Battn. 13th Foot	Floriana	573	671	...	...	6	4	137	...	38	...	181	4
1st Battn. 18th Foot	In Camp till 28th February ... ... Fort Ricasoli ... Salvatore and Zabbar gate Barracks ...	612	694	...	...	4	1	115	1	214	...	333	2
1st Battn. 24th Foot	Same as 1st Battalion 18th Foot	99	Embarked in February	...	...	1	...	2	...	1	...	4	...
28th Regt.	Isola Gate ... ... Polverista Gate ... San Francesco di Paolo Barracks ...	551	677	...	...	4	...	77	...	94	...	175	...
31st „	Verdala and St. Clement's Bastion	132	Embarked in February	...	...	1	...	...	...	1	...	2	...
48th „ ...	Floriana	65	Embarked in February	...	...	..	...	4	...	1	...	5	...
52nd „	Fort Manoel and Pembroke Camp till 16th May ... Afterwards Lower St. Elmo	670	692	1	...	2	...	60	2	52	...	115	2
64th „	Isola Gate ... ... Polverista Gate ... San Francesco di Paolo Barracks ...	123	Embarked in March.	...	...	...	...	5	...	4	...	9	...
74th „ ...	Verdala	587	690	...	...	...	...	167	3	...	...	167	3
78th „ ...	Lower St. Elmo ...	217	Embarked in May.	...	...	2	...	5	...	3	...	10	...

The ages of the men who died were as follows:—

	Under 20.	20 to 25.	25 to 30.	30 and upwards.
Enteric Fever	4	2	3	1
Simple Continued Fever	1	4	1	3

From the preceding Tables it will be seen—1st. That febrile diseases were much more prevalent in the regiments which arrived in the island during the year than in those of longer service in it; 2ndly. That in the only battalion which arrived from the United Kingdom (the 1st of the 18th Regiment) they were much more prevalent than in those which arrived from Gibraltar (the 1st of the 13th, and the 28th and 74th); 3rdly. That the proportion of the deaths which took place among very young men was smaller in simple continued fever than in enteric fever; and, 4thly. That while the period of greatest prevalence of simple continued fever and febricula was the hottest season of the year (July and August), the ratio of admissions gradually increasing until that season was reached, and decreasing after it was past, enteric fever was greatly most prevalent and most fatal during the last two quarters of the year, and particularly during the last one, the admissions during which were exactly equal to those during the rest of the year.

The character of the attacks, in the cases returned as simple continued fever and febricula, was the same as in previous years. In some of the slighter cases intemperance is said to have been one of the chief causes of the febrile condition. Many more of those which occurred in men of short service in the island were, no doubt, chiefly the result of exposure to extreme heat, and the absence of all means of moderating its effects; but it was observed that although attacks were more numerous among such unacclimatized men than among others of longer service in Malta, they were as a rule much less severe. In the more severe cases the febrile symptoms were generally very protracted, a very high temperature being observed for an unusually long but a variable period, and they gradually subsided without the occurrence of anything resembling a crisis. Relapses, after the complete absence of fever for several days, were not infrequent, and the fourteenth day is mentioned as one on which they were several times observed. Gastric irritability was a very frequent symptom, but diarrhœa seems to have been rare. Orchitis, rheumatism, and severe and persistent neuralgia were frequent sequelæ, and convalescence was almost always protracted and interrupted by the occurrence of one or more of them.'

The most marked and constant pathological appearance in fatal cases was great enlargement and a very friable condition of the spleen, which was found to weigh from 12 ozs. to 5 lbs. Congestion of the stomach and small intestine, but without ulceration of the latter or any affection of either the agminated or the solitary glands, are also mentioned as having been observed.

In addition to intemperance, and the direct effects of heat, various insantary conditions are mentioned by the Rgimental Medical Officers as probably concerned in the production of the more severe cases of continued fever; the inferiority of most of the barracks; the want of sufficient ventilation; and pollution of the air by emanations from faulty drains and filthy surroundings, being the chief among them.

The cases of enteric fever, most of which occurred after the period of extreme heat was over, are attributed to the usual causes. The rooms in the Floriana Barracks are said to be close and offensive in the morning, a fœcal smell being perceptible in those on the S.E. side, the result, it is believed, of a fault of drainage in the civil hospital, which overlooks them on that side. The men of the 13th Regiment who died of enteric fever are reported to have lived in the rooms most affected by such malodours. To diminish the risk inseparable from the occupation of these barracks, two-thirds of the men slept in tents on the parade ground from *June to October*; no man being allowed to sleep for two consecutive nights in barracks; and the result of that measure is believed to have been most beneficial.

Malta. The Surgeon of the 74th attributes much of the sickness in the Verdala Barracks to "the very bad drainage and filth of the neighbourhood."

The Surgeon of the 1st Battalion 18th Regiment states that the only fatal case of enteric fever in that corps was admitted from Fort Ricasoli in September, and that two fatal cases in men of the Royal Artillery were admitted from the neighbouring barrack-room at the same time, there being then a serious derangement of the latrine sewerage at the N.E. outlet, and an old and offensive cesspit in the vicinity having just been cleaned out. To these sources he attributes the attacks.

The Lower St. Elmo barracks, which were formerly so unhealthy, now receive a much better character, and the statistics on page 64 show that they were comparatively healthy last year. The Surgeon of the 52nd Regiment reports that the men of that corps had little more sickness in them during the latter half of the year than they had in Fort Manoel and Pembroke Camp during its first half.

The admissions and deaths from continued fevers among the officers, women, and children were as follows :—

	Admitted for Continued Fevers.	Died of Continued Fevers.	Ratio per 1,000 of Strength.	
			Admitted.	Died.
Officers	46	1	211·0	4·59
Women	68	1	133·3	1·96
Children	55	3	55·8	3·04

These ratios, except that of deaths among the officers, are more favourable than those for the men. The ratios of admissions from all causes among the same classes are also more favourable than those for the men, but the ratios of deaths are very much less so.

	Admissions from all causes.	Deaths from all causes.	Ratio per 1,000 of Strength.	
			Admitted.	Died.
Officers	170	6	779·8	13·76
Women	392	9	768·6	17·65
Children	875	84	888·3	85·28

So high a death-rate among the children affords sure proof of the unfavourable conditions under which the married soldiers must have lived, and confirms the statements of the medical officers as to the existence of some of the causes to which they attribute the prevalence of continued fevers. Of the deaths among the children 26 were from diarrhœa, 19 from debility, atrophy, marasmus, and tabes mesenterica, 8 from diphtheria, 8 from measles, 6 from fevers, 3 from nervous, and 4 from pulmonary diseases; the remaining 10 were from various causes.

Paroxysmal Fevers, though twice as prevalent as in 1871, were still extremely rare. Only 6 admissions per 1,000 of the strength were caused by them, and none of the cases were fatal. Most of them are stated to have been relapses of disease contracted elsewhere.

Rheumatism was slightly less prevalent than in 1871, though rather above the average of previous years.

Syphilis was greatly more prevalent than in 1871, and the ratio of admissions for it exceeded threefold the average for the three years from 1869 to 1871. The reports of the regimental medical officers afford no information as to the causes of the increase, but the Principal Medical Officer states that the disease was spread chiefly by abandoned women, nominally the wives of

soldiers, who, by being so, escaped the operation of the Contagious Diseases Act. *Malta.*

Scrofula and Phthisis caused twice as many admissions as in 1871, but only the same number of deaths, the latter being very slightly in excess of the average for previous years. Nearly the half of the admissions for phthisis occurred in the 1st Battalion of the 13th Regiment, stationed in Floriana Barracks, but only one man of that regiment died of the disease.

Local Diseases.—There was a marked increase in every important order of this class, except diseases of the *respiratory* system, which were somewhat less prevalent. In diseases of the *digestive system* the increase was greatest in tonsillitis, dyspepsia, and diarrhœa. Tænia solium continued very prevalent in the 52nd Regiment, 28 admissions being recorded from it, but its prevalence was much less than in 1871, when 63 cases occurred in the same regiment.

In *urinary* affections the increase was confined to gonorrhœa, which caused more admissions in the Artillery and the 52nd Regiment than in any of the other corps.

Poisons.—Under this head a large increase appears, but it is the result of many cases, chiefly in the Artillery, being erroneously returned under poisoning by alcohol, instead of dyspepsia or febricula, in consequence of the dyspeptic or febrile symptoms being the result of intemperance. The proportion of admissions for delirium tremens was considerably less than in 1871.

Injuries.—The admissions for injuries were rather more than 10 per 1,000 of the strength in excess of the average, but the mortality from them was below it. There were no deaths by suicide.

Royal Malta Fencible Artillery.

The average strength of this Corps during the year was 592, the admissions into hospital were 468, and the deaths were 5. The ratios per 1,000 of the strength represented by these numbers are, for admissions 791, and for deaths 8·45, the former being slightly under, and the latter considerably above the ratio for 1871. The ratio of admissions was below the average for the previous ten years. That of deaths was almost identical with it.

The following Table, which has been framed from Abstract No. 10 of the the Appendix, shows the admissions and deaths from the several classes and orders of diseases —

Malta.

Orders.	Diseases.	Royal Malta Fencible Artillery. Average Strength .. .. 592. Annual Ratio per 1,000 of strength. 1872. Admitted.	1872. Died.	1869–71. Admitted.	1869–71. Died.	Line Regiments at Malta in 1872. Annual Ratio per 1,000 of Strength. Admitted.	Died.
	I. *General Diseases.*						
1	Febrile Group	32	2	54·1	3·38	61·4	1·19	244·5	3·91
2	Constitutional „	53	..	89·5	..	79·9	1·19	101·9	1·44
	II. *Local Diseases.*						
	Diseases of the—						
1	Nervous System	7	1	11·8	1·69	11·9	·60	13·2	·21
2	Eye	81	..	136·8	..	129·9	..	36·7	..
3	Ear	1	..	1·7	..	1·2	..	4·7	..
4	Nose	..	..	..	..	1·2	..	·6	..
5	Circulatory System	3	..	5·1	..	4·2	·60	12·6	1·03
6	Absorbent „	1	..	1·7	..	2·4	..	6·8	..
8	Respiratory „	37	..	62·5	..	59·6	..	41·4	·82
9	Digestive „	107	1	180·7	1·69	184·1	1·19	143·6	·61
10	Urinary „	44	..	74·3	..	62·0	..	52·1	·21
11	Generative „	9	1	15·2	1·69	5·9	..	16·5	..
12	Organs of Locomotion ..	..	..	..	..	3·6	..	4·3	..
13	Cellular Tissue	34	..	57·4	..	36·3	..	29·2	·21
14	Cutaneous System	46	..	77·7	..	116·2	..	72·9	..
	III. *Conditions, &c.*						
	Debility	1	..	1·7	..	2·4	..	14·2	..
	IV. *Poisons*	..	..	..	..	1·8	..	27·1	..
	V. *Injuries.*						
2	Accidental	12	..	20·3	..	47·1	..	103·0	·41
4	Self-inflicted	..	..	..	..	·6	..	·8	..
	VI. *Surgical Operations* ..	..	..	..	..	...	..	·4	·21
	No appreciable disease ..	..	..	..	..	·6	..	1·4	..
	Total	468	5	790·5	8·45	812·3	4·77	927·9	9·06
	Average of 10 years, 1862–71 .	..	..	847·7	8·42	..	..	792·8	13·65

General Diseases.—The admissions from this class were fewer than in 1871, but slightly above the average of the previous three years. The reduction was confined entirely to the febrile group, from which there were only 32 admissions and 2 deaths. In these numbers are included 1 admission and 1 death from pyæmia and 1 admission for erysipelas. Three of the cases of fever, including the fatal case, were returned as enteric, and the remainder as simple continued fever or febricula. The two latter diseases occurred for the most part during the months of October, November, and December, their

usual period of greatest prevalence being July and August. There were no admissions for eruptive fevers during the year. *Malta.*

From the constitutional group the admissions were almost in the same ratio as in 1871, but above the average of previous years, the excess being chiefly in rheumatism, and attributed by the Medical Officer to "the great and sudden changes of weather and temperature that took place during the year." Syphilis was less prevalent than in 1871, in the ratio of 25·3 to 42·6.

Local Diseases.—Diseases of the *eye* continued very prevalent, though less so than in 1871. The majority are reported to have been slight cases of conjunctivitis, none of which were followed by impaired vision or any organic lesion. Diseases of the *digestive system* caused more admissions than any other order of this class, but considerably more than two-thirds of them were for tonsillitis and dyspepsia. From diseases of the *urinary system*, all of which were cases of gonorrhœa or its sequelæ, for the most part in recruits, the admissions were in the annual ratio of 74·3 per 1,000 of the strength. In 1871 the ratio was 90·6.

SANITARY REPORT.

Inspector-General J. H. Ker Innes, C.B., remarks, in reference to the increase of admissions, that this is most apparent under the following heads, viz.: *Fevers.*—In this instance the admissions were doubled. *Rheumatism.*—The excess is not very notable, being only 22. *Syphilis.*—The admissions under this head were doubled. *Phthisis pulmonalis, Disease of Nervous System, Diseases of Circulatory System.*—Admissions more than doubled. *General Debility.*—Admissions more than trebled.

When however an endeavour is made to trace home this increase to the localities in which it has actually occurred, it is found that the data are vitiated by the modifying circumstances affecting the several corps, and by the very temporary character of their occupation. Thus Fort Ricasoli, ordinarily one of our healthiest barracks, appears to have yielded a proportion of fever cases in excess of any other barrack when it was occupied by the 1st Battalion 18th Regiment, during the year, the fact being due to the unhealthy condition of that corps immediately before its arrival at the station. Pembroke Camp, one of the healthiest and most desirable quarters in the command, shows a wholly undue percentage, from the circumstance of its partial occupation by detached companies, more or less composed of invalids belonging to corps the head-quarters of which have been located elsewhere.

A similar augmentation of disease, over that which has obtained in ordinary years, has been apparent amongst the civil population of the island.

Amongst the most prominent causes of the maladies from which the military have suffered, may be noted the dark, damp, and ill-ventilated casemates in which, as a rule, the troops have been quartered, together with the total absence of means for warming and drying them, defective drainage and sewerage. Intemperance and crime, ever fertile sources of evil amongst soldiers, are in a large degree attributable to defective barrack accommodation; to these may be superadded the effects of climate.

Much, however, has been done to improve the condition of the soldier, and a number of sanitary improvements have been recently introduced in connection with the barracks.

A large military hospital has been erected in the Cotonera district, which will shortly be made over for use. It is very complete in all its arrangements, the kitchen accommodation, and that for resident medical officers being the sole deficiencies.

Inspector-General Innes considers the clothing capable of advantageous modification in this, as in many other of our colonies. He regards the use of the flannel shirt as essential to the well-being of the soldier, in a climate so variable as that of Malta; the growth of the beard should be encouraged, and the structures of the neck left wholly free and unconstricted. Above all, the protection afforded to the head should be rendered more adequate. Under a

Malta. temperature which frequently reaches 150° Fahr. in the sun's rays, the present head-dress is insufficient, and an irksome and enforced confinement to barracks, which becomes necessary, is provocative of intemperance and *ennui*. These matters have been brought to the notice of his Excellency the Lieutenant-General Commanding.

Section II.

On the Extent of Invaliding among the Troops serving in the Mediterranean.

Mediterranean The invalids sent home from Gibraltar and Malta respectively were 148, and 75, which numbers give the ratios of 36·4 and 15·4 per 1,000 of the strength. There were discharged at Netley, from Gibraltar 92, and from Malta 56, or 22·6, and 11·5 per 1,000 of the strength.

The disabilities of the invalids are shown in the following Table, framed from Abstract No. 10 of the Appendix:—

	Invalids sent home from			Invalids discharged at Netley from		
	Gibraltar.	Malta.	Total.	Gibraltar.	Malta.	Total.
Continued Fevers	3	2	5	..	..	..
Paroxysmal „	1	2	3	..	..	..
Rheumatism	19	..	19	3	2	5
Syphilis	4	2	6	2	1	3
Scrofula and Phthisis	18	15	33	19	14	33
Other general diseases	2	1	3	1	1	2
Diseases of the—						
Nervous System	11	12	23	4	4	8
Eye, Ear, and Nose	8	6	14	11	5	16
Circulatory System	20	8	28	19	11	30
Respiratory „	20	..	20	6	..	6
Digestive „	15	11	26	11	5	16
Urinary „	4	4	8	1	..	1
Generative „	..	1	1	1	..	1
Organs of Locomotion	6	3	9	5	4	9
Cellular Tissue	1	..	1	..	..	..
Cutaneous System	1	1	2	..	1	1
Debility	11	4	15	8	5	13
Accidental injuries	4	3	7	1	1	2
Self-inflicted „	..	..	..	..	1	1
Surgical Operations	..	..	..	..	1	1
Total	148	75	223	92	56	148
Ratio per 1,000 of { 1872	36·4	15·4	25·0	22·6	11·5	16·6
Mean Strength { 1862–71	29·2	23·1	26·0	20·8	17·3	19·0

The number of men sent home from Gibraltar on account of sickness was considerably in excess of the average, but about the half of them were sent away for change of climate only, and the number ultimately discharged as unfit for service at Netley did not greatly exceed the usual proportion. The number sent home from Malta, and the proportion of them discharged at Netley, were both considerably below the average.

The difference between the two stations in this respect is, however, in a great measure to be explained by the fact that 29 men who were ultimately invalided to England, were left at Gibraltar sick by the regiments which

proceeded from that station to Malta in the beginning of the year. Taking the two together the proportion of men sent home as invalids was ·9, and that of men finally discharged from the service was 2·2 per 1,000 of the strength below the average. *Mediterranean*

At Gibraltar, diseases of the circulatory and respiratory systems, and after them tubercular diseases, were the most frequent causes of invaliding; the first and last of these orders being also the most frequent causes of final discharge. At Malta, tubercular diseases, and diseases of the nervous system, were the most frequent causes of invaliding, and tubercular diseases and affections of the circulatory system, of final discharge. No men were invalided there for diseases of the respiratory system.

Section III.

Mean Daily Sick.

The average number constantly sick during the year was 134 at Gibraltar, and 232 at Malta; being in the ratio of 32·9 at the former, and 47·8 at the latter, per 1,000 of the mean strength. The former ratio is slightly, and the latter very considerably above the corresponding ratio for 1871. The sick of the Royal Malta Fencible Artillery are not included in the average for Malta.

The usual information, deduced from these numbers, is given in the following Table:—

		Gibraltar.	Malta, exclusive of Royal Malta Fencibles.	United Kingdom. Infantry Regiments. Average of ten years, 1862–71.
Average Strength in 1872		4,066	4,855	
Average constantly sick		134	232	
Ratio per 1,000 constantly sick	1872	32·9	47·8	34·25
	1862–71	35·6	41·7	38·56
		days	days	days
Average sick time to each Soldier	1872	12·06	17·49	12·02
	1862–71	13·00	15·23	14·07
Average duration of the cases	1872	18·90	18·85	17·94
	1862–71	18·17	19·21	18·35

Compared with the statistics for 1871, this shows a slight increase in every respect at Gibraltar, and a much greater increase at Malta. Except as to the duration of the cases, the average of the previous ten years is also considerably exceeded in every respect by the results for the latter station.

Section IV.

On the Influence of Age on the Mortality.

The following Table has been framed from Abstract No. 11 in the Appendix, in which the ages of the men serving in the Mediterranean commands, arranged in quinquennial periods, and the number of deaths for each period, are shown in detail:—

		Ratio of deaths per 1,000 of strength at each period of life.					
		Under 20.	20 and under 25.	25 and under 30.	30 and under 35.	35 and under 40.	40 and upwards.
Mediterranean Commands	1872	3·66	5·21	10·61	8·26	9·71	26·08
	1862–71	3·43	5·60	11·25	14·13	24·40	30·97

III.—ON THE HEALTH OF THE TROOPS SERVING IN THE DOMINION OF CANADA.

Section I.

Sickness and Mortality.

STATISTICAL REPORT.

Dominion of Canada.

THE only station in the Dominion of Canada occupied by British troops during the year was Halifax, and their average strength there amounted only to 1,602. The 87th Regiment arrived from Malta on the 8th June, and the 61st embarked for England on the 17th of the same month. With these exceptions there was no change in the constitution of the force.

The admissions into hospital were 941, and the deaths 8, of which two occurred out of hospital. The ratios per 1,000 of the strength represented by these numbers are, for admissions 587·4, and for deaths 4·98, which are considerably lower than those for the preceding year. The ratio of deaths does not greatly exceed the half of the average ratio for the ten years from 1862 to 1871.

The sickness and mortality in each of the corps were as follows:—

Corps.	Average Annual Strength.	Admitted into Hospital.	Deaths.				Annual ratio per 1,000.	
			In Hospital.	Out of Hospital.	Of Invalids.	Total.	Admitted.	Died.
Royal Artillery ..	312	232	1	..	..	1	744	3·21
Royal Engineers ..	85	64	..	..	..	..	753	..
1st Bn. 60th Rifles ..	554	261	2	..	..	2	471	3·61
61st Regiment ..	251	176	2	..	..	2	701	7·97
87th „	378	200	1	2	..	3	529	7·94
Army Hospital Corps Army Service Corps, &c... ..	22	8	..	..	..	..	364	..

The following Table, compiled from Abstract No. 12 in the Appendix, shows the admissions and deaths from the different classes and orders of diseases:—

Dominion of Canada.

Orders.	Diseases.	Strength, 1,602.				1872.		1869-71.	
		Admissions.	Deaths.			Annual Ratio per 1,000.		Annual Ratio per 1,000.	
			In Dominion of Canada.	Of Invalids.	Total.	Admissions.	Deaths.	Admissions.	Deaths.
	I. *General Diseases.*								
1	Febrile Group ..	63	1	..	1	39·3	·62	38·7	·50
2	Constitutional „ ..	165	1	..	1	103·0	·62	117·4	1·31
	II. *Local Diseases.* Diseases of the—								
1	Nervous system	15	..	..	..	9·4	..	9·8	·99
2	Eye	19	..	..	..	11·9	..	14·0	..
3	Ear	3	..	..	..	1·9	..	2·4	..
4	Nose	..	..	..	..	..	..	·6	..
5	Circulatory system ..	10	3	..	3	6·2	1·87	6·1	1·43
6	Absorbent „ ..	11	..	..	..	6·9	..	17·0	..
7	Ductless Glands.. ..	..	..	..	..	..	..	·1	..
8	Respiratory system ..	120	2	..	2	74·9	1·25	69·8	1·43
9	Digestive „ ..	182	..	..	..	113·6	..	73·3	·44
10	Urinary „ ..	64	..	..	..	39·9	..	84·4	·37
11	Generative „ ..	17	..	..	..	10·6	..	11·1	..
12	Organs of Locomotion ..	7	..	..	..	4·4	..	4·0	·13
13	Cellular Tissue	28	..	..	..	17·5	..	21·0	·06
14	Cutaneous system ..	70	..	..	..	43·7	..	52·1	..
	III. *Conditions, &c.*								
	Debility	13	..	..	..	8·1	..	3·8	·31
	IV. *Poisons* ..	6	..	..	..	3·7	..	10·3	..
	V. *Injuries.*								
2	Accidental	148	1	..	1	92·4	·62	83·5	·87
3	Homicidal „ ..	..	..	..	..	..	..	·1	·13
4	Self-inflicted	..	..	..	..	..	..	·2	·56
	VI. *Surgical Operations*	..	..	..	..	..	..	·3	..
	No appreciable disease ..	..	..	..	..	..	..	·9	..
	Total	941	8	..	8	587·4	4·98	620·9	8·53
	Average of 10 years, 1862-71.. ..	..	..	..	..	654·3	8·39	..	..

GENERAL DISEASES were rather less prevalent than during the preceding year, but more fatal, the mortality from them, however, being still very slight (1·24 per 1,000 of the strength). They were both less prevalent, and less fatal than they had been on the average during the three preceding years. The reduction was confined to the constitutional group included under Subdivision B. In the febrile group the ratio of admissions slightly exceeded both that for 1871, and the average for the three years from 1869 to 1871.

The following Table shows the admissions and deaths from the principa diseases included in this class:—

Dominion of Canada.

Diseases.	Admitted.	Died.	Ratio per 1,000 of Strength. 1872. Admitted.	1872. Died.	1869-71. Admitted.	1869-71. Died.
Febrile—						
Eruptive Fevers	4	..	2·5	..	2·6	·06
Continued „	24	1	15·0	·62	18·4	·31
Paroxysmal „	10	..	6·2	..	5·6	..
Influenza	18	..	11·2	..	7·1	..
Erysipelas	7	..	4·4	..	4·7	·06
Other Diseases of this group	..	..	..	..	·3	·06
Total of Febrile Group	63	1	39·3	·62	38·7	·49
Constitutional—						
Rheumatism	49	..	30·6	..	35·9	..
Syphilis	105	..	65·5	..	73·3	..
Scrofula, Phthisis, &c.	9	1	5·6	·62	6·0	1·12
Scurvy and Purpura	..	..	..	..	·8	..
Anæmia	..	..	..	..	·4	..
Other Diseases of this group	2	..	1·3	..	1·0	·18
Total of Constitutional Group ..	165	1	103·0	·62	117·4	1·30

Eruptive Fevers were less prevalent than in 1871. All admitted were cases of measles, and all occurred in the 87th Regiment. That disease, and scarlet fever, prevailed to a serious extent among the soldiers' children, 97 admissions and one death being recorded from the former, and 24 admissions and four deaths from the latter.

The ratio of admissions for *continued fevers* was higher than in 1871, but below the average for the three years from 1869 to 1871; and, with the exception of one in the 60th Rifles which proved fatal, all the cases admitted were slight. Most of them occurred in the Artillery.

Paroxysmal Fevers were rather above the average, and of them also the greater part occurred in the Artillery, most of them being relapses of ague, reported to have been contracted at Sheerness.

Influenza, though considerably less prevalent than in 1871, was still above the average of previous years.

Rheumatism was considerably less prevalent, and there was a material reduction in the prevalence of *syphilis*, the ratio of admissions being nearly 9 per 1,000 of the strength lower than in 1871.

Local Diseases.—There was a reduction in diseases of the *nervous*, *absorbent*, *urinary* and *cutaneous systems*, and a considerable increase in those of the *digestive system*, the increase being, however, confined to "dyspepsia," which is reported to have been chiefly the result of intemperance.

Injuries.—The ratio of admissions for injuries was still considerably above the average of former years, though rather lower than that for 1871. The only fatal case was one of accidental drowning.

SANITARY REPORT.

Deputy Inspector-General Dr. Lloyd states :—

The troops in this command have enjoyed excellent health throughout the year. The percentage of sickness has been less than usual, and there have been but few cases of serious illness, and only eight deaths from all causes, in and out of hospital.

The most important sanitary defects in the garrison are the cesspit privies

at the Royal Artillery and Royal Engineer quarters; the want of isolated wards for epidemic and infectious cases; a ward is also required for lying-in women, and those suffering from serious illness. *Dominion of Canada.*

Section II.

On the Extent of Invaliding.

Only 7 invalids were sent to England during the year, but 17 were discharged from the service at Netley, and 7 in Canada, the majority of the former having remained from the year before either at Netley, or *en route* to that station from Halifax. The invalids sent home were in the ratio of 4·37, and those discharged from the service in that of 14·98 per 1,000 of the strength.

The following Table, compiled from Abstract No. 12 in the Appendix, shows the particular diseases by which the invaliding was caused:—

Disabilities.	Invalids sent home.	Invalids Discharged the Service.	
		In Canada.	At Netley.
Rheumatism	1	2	2
Phthisis	..	..	2
Paralysis	1	..	1
Diseases of the—			
Circulatory System	..	1	3
Respiratory „	2	..	1
Digestive „	1	..	4
Ostitis	2	..	1
Tumour	..	..	1
Debility	..	4	1
Sprain	..	..	1
Total	7	7	17
Ratio per 1,000 of Mean Strength .. .. 1872 ..	4·37	4·37	10·61
Ratio per 1,000 of Mean Strength .. .. 1862–71.	16·30	2·34	10·58

The number of men sent home as invalids was much below the average, but the number finally discharged was slightly above it, the majority of those discharged at Netley being, however, as has already been explained, men who had been sent home in 1871. Debility, rheumatism, diseases of the heart and great blood vessels, hernia, hepatitis, and phthisis, were the disablities of most of them.

Section III.

Mean Daily Sick.

The average number constantly sick during the year was 48·76, being in the ratio of 29·74 per 1,000 of the strength, which is rather below the average.

In the following Table the usual information deduced from these figures is given:—

	1872.	1862–71.
Ratio per 1,000 of strength constantly sick ..	29·74	30·71
	days.	days.
Average sick time to each soldier	11·39	11·21
Average duration of the cases of disease ..	18·96	17·13

Dominion of Canada.

These results are more favourable than those for 1871, except as to the average duration of the cases of sickness, in which there was a slight increase. With the same exception they correspond very closely with the average for the last ten years.

Section IV.

On the Influence of Age on the Mortality.

The following Table, framed from Abstract No. 13 in the Appendix, shows the ratio of deaths per 1,000 of the strength at the several ages, in the portion of the force which was in the command during the whole of the year :—

		Under 20	20 and under 25.	25 and under 30.	30 and under 35.	35 and under 40.	40 and upwards.
Ratio of Deaths per 1,000 of mean strength	1872 ..	8·62	..	..	6·55	..	..
	1862–71	3·29	5·93	9·77	11·21	17·46	23·28

These results, except for men under 20, are unusually favourable, but the strength of the portion of the force to which they refer is now so small that great fluctuations in the ratio of mortality in it must be looked for.

IV. ON THE HEALTH OF THE TROOPS SERVING IN BERMUDA.

Section

Sickness and Mortality.

STATISTICAL REPORT.

Bermuda.

Nos. 2 and 8 Batteries of the 3rd Brigade Royal Artillery embarked for England on the 7th December, and Nos. 3 and 4 of the 7th Brigade arrived from England on the 2nd December. These were the only changes in the constitution of the garrison during the year.

The average strength of the troops forming it was 1,770 ; the admissions into hospital were 1,112 ; and the deaths, including 4 out of hospital, amounted to 13. The ratio of admissions per 1,000 of the strength was therefore 628, and that of deaths 7·33 ; the former being slightly lower, and the latter much lower than the corresponding ratio for 1871. Both are much below the average of previous years.

The following Table shows the sickness and mortality in the different corps :—

Corps.	Average Annual Strength.	Admitted into Hospital.	Died.				Ratio per 1,000 of Strength.	
			In Hospital.	Out of Hospital.	Of Invalids.	Total.	Admitted.	Died.
Royal Artillery.. ..	217	163	2	..	..	2	751	9·22
„ Engineers ..	308	218	..	1	..	1	708	3·25
53rd Regiment.. ..	589	368	5	1	..	6	625	10·19
69th „	602	332	..	2	..	2	551	3·32

The other two deaths were those of a Serjeant of the Army Hospital Corps, who died of sunstroke at Prospect Hill, and a Serjeant of the Army Service Corps who died of delirum tremens at the same place. *Bermuda.*

The admissions and deaths from the different classes and orders of diseases are shown in the following Table, compiled from Abstract No. 12 of the Appendix :—

Orders.	Diseases.	1872. Average Strength, 1,770. Admitted into Hospital.	Deaths. At Bermuda.	Deaths. Of Invalids.	Deaths. Total.	Annual ratio per 1,000 of Strength. Admitted.	Annual ratio per 1,000 of Strength. Died.	1869-71. Annual ratio per 1,000 of Strength. Admitted.	1869-71. Annual ratio per 1,000 of Strength. Died.
	I. *General Diseases.*								
1	Febrile Group ..	77	2	..	2	43·5	1·13	111·6	4·09
2	Constitutional „ ..	112	1	..	1	63·3	·56	80·6	2·84
	II. *Local Diseases.*								
	Diseases of the—								
1	Nervous system ..	19	1	..	1	10·7	·56	10·6	1·07
2	Eye	23	..	..	..	13·0	..	29·5	..
3	Ear	2	..	..	..	1·1	..	4·9	..
4	Nose	1	..	..	..	·6	..	·1	..
5	Circulatory system ..	12	2	..	2	6·8	1·13	9·0	1·24
6	Absorbent „ ..	25	..	..	..	14·1	..	10·3	..
8	Respiratory „ ..	46	2	..	2	26·0	1·13	45·8	·18
9	Digestive „ ..	294	..	..	..	166·1	..	169·2	1·42
10	Urinary „ ..	47	..	..	..	26·5	..	33·0	·53
11	Generative „ ..	20	..	..	..	11·3	..	9·7	..
12	Organs of Locomotion ..	4	..	..	..	2·3	..	1·9	..
13	Cellular Tissue	65	..	..	..	36·7	..	24·8	·18
14	Cutaneous system ..	129	..	..	..	72·9	..	84·4	·18
	III. *Conditions, &c.*								
	Debility	17	..	..	..	9·6	..	10·6	..
	IV. *Poisons* ..	20	1	..	1	11·3	·56	19·9	1·24
	V. *Injuries.*								
2	Accidental	196	2	..	2	110·7	1·13	117·1	1·96
4	Self-inflicted	2	2	..	2	1·1	1·13	·5	1·42
	VI. *Surgical Operations* ..	..	..	..	..	..	..	·1	..
	No appreciable disease ..	1	..	..	..	·6	..	..	..
	Total	1,112	13	..	13	628·2	7·33	773·6	16·35
	Average of 10 years 1862-71	..	..	..	..	774·0	28·75	..	..

General Diseases were greatly less prevalent and less fatal than in 1871, and much below the average of previous years. The reduction extended over both groups, but was most marked as to admissions in the febrile, and as to deaths in the constitutional one.

The following Table shows the admissions and deaths from the principal diseases of this class :—

Bermuda

Diseases.	Admitted.	Died.	Ratio per 1,000 of Mean Strength. 1872. Admitted.	1872. Died.	1869–71. Admitted.	1869–71. Died.
Febrile—						
Continued Fevers	58	2	32·8	1·13	95·6	4·09
Paroxysmal „	4	..	2·2	..	1·4	..
Influenza	14	..	7·9	..	13·9	..
Erysipelas	..	..	..	..	·5	..
Other diseases of this group ..	1	..	·6	..	·2	..
Total of Febrile Group.. ..	77	2	43·5	1·13	111·6	4·09
Constitutional—						
Rheumatism	44	..	24·8	..	39·8	..
Syphilis	52	..	29·4	..	30·0	·18
Scrofula, Phthisis, &c.	15	1	8·5	·56	10·1	2·48
Anæmia	1	..	·6	..	..	..
Other Diseases of this group ..	..	..	..	..	·7	·18
Total of Constitutional Group..	112	1	63·3	·56	80·6	2·84

Continued Fevers were less prevalent by nearly two-thirds, and less fatal by more than a-half, than in 1871. The two deaths, which were returned under simple ocntinued fever, occurred in the 53rd Regiment at Prospect Hill. The regimental report contains no information as to the character and causes of the febrile attacks in these cases, but the majority of the febrile attacks at the station are stated by the Principal Medical Officer to have been the result of heat and intemperance. Only two cases of enteric fever occurred during the year, one in the Artillery, the other in the 69th Regiment, and neither proved fatal.

Influenza was less prevalent than usual.

Rheumatism also was considerably below the average.

Syphilis prevailed to almost the same extent as in former years. It was in a great measure confined to the two infantry regiments, in which, in an aggregate strength of 1,191, there were 41 admissions, while in the Artillery and Engineers, of which the average strength was 525, the admissions amounted only to 8. Considerably more than half the admissions, including 16 out of 19 for secondary syphilis, occurred in the 69th Regiment.

Scrofula, Phthisis, &c., were much less prevalent than in 1871, and greatly below the average of previous years. In the mortality resulting from them the reduction was still greater, the ratio of deaths per 1,000 of the strength being less than a ninth of that for 1871, and less than a fourth of that for 1869–71. In a climate like that of Bermuda, and in a garrison of moderate strength, great fluctuations in the ratio of mortality from these diseases must be expected.

Local Diseases.—Diseases of the *eye*, and those of the *respiratory* and *urinary systems* were considerably below the average, and diseases of the *digestive system* were slightly so. A slight increase in the latter, compared with 1871, took place chiefly in dyspepsia, many of the cases of which are stated to have been the result of intemperance. In dysentery and diarrhœa there was a considerable reduction. There were no deaths from diseases of this order.

Injuries.—The admissions for accidental injuries were in rather less than the usual proportion. There were two deaths by accidental drowning, and two cases of suicide by cut-throat.

SANITARY REPORT.

Bermuda.

Deputy Surgeon-General Webb reports:—

The troops during the year 1872 have been remarkably healthy; there has been complete immunity from anything like an epidemic disease.

The recommendations of my predecessor, Dr. Bowen, that men of each barrack-room should be put under canvas for a fortnight, for the purpose of having the rooms well ventilated and lime-washed, as well as a number of men always in tents, to allow those remaining in barracks at least 1,000 cubic feet, have been persevered in with good results.

The number of admissions into hospital, for diseases caused indirectly by intemperance, continues very large.

The chief sanitary improvements completed are as follows:—Earth-closets at *Prospect*, fitted with Moule's patent apparatus, and contagious diseases hospital in course of completion. *St. George's.*—Latrines of married quarters drained into the sea instead of into cesspits. New barracks are in course of building, which will consist of 16 rooms, each capable of containing 16 men. It is expected that 8 will be completed in 1873-74. When the whole are finished, there will be no more occasion for tents. The buildings, formerly occupied by convicts at Boaz, have had the iron partitions removed, and the iron bars from the windows, which have been glazed.

Section II.

On the Extent of Invaliding.

Thirty-nine invalids were sent home from Bermuda during the year, and 13 were discharged from the service at Netley, the ratios per 1,000 of the strength represented by these numbers being 22·03, and 7·34. Of these the former is considerably below the ratio for 1871, and almost identical with the average for the ten years from 1862 to 1871, the latter is much below the ratios for both periods.

The following Table, framed from Abstract No. 12 of the Appendix, shows the particular diseases by which the invaliding was caused:—

Diseases.	Invalids sent Home.	Discharged the Service at Netley.
Rheumatism	2	..
Syphilis	2	1
Scrofula and Phthisis	6	4
Diseases of the—		
Nervous System	8	1
Eye	1	1
Circulatory system	6	2
Respiratory „	..	1
Digestive „	4	1
Generative „	1	..
Organs of Locomotion	1	..
Diseases of Cellular Tissue	2	..
„ Cutaneous System	3	1
Debility	2	1
Accidental injuries	1	..
Total	39	13
Ratio per 1,000 of strength 1872	22·03	7·34
Ratio per 1,000 of strength 1862–71	21·91	13·88

Bermuda. Scrofula and phthisis were the most frequent causes of final discharge, but diseases of the nervous system caused more invaliding to England.

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ection III.

Mean Daily Sick.

The average number in hospital throughout the year was 50·12, or 28·32 per 1,000 of the strength, which is considerably below the average of former years.

The following Table gives the usual information calculated from that number :—

	1872.	1862–71.
Ratio per 1,000 of strength constantly Sick ..	28·32	39·56
	days.	days.
Average Sick time to each Soldier	10·36	14·48
Average duration of the cases of Disease	16·50	18·74

The results for 1872 are more favourable than those for 1871, and greatly more so than those for the previous ten years. As in 1871, they are lower in all particulars than those for the troops in Canada.

Section IV.

On the Influence of Age on the Mortality.

The following Table, compiled from Abstract No. 13 of the Appendix, shows the ratios of mortality at the several ages, arranged in quinquennial periods :—

		Under 20.	20 and under 25.	25 and under 30	30 and under 35.	35 and under 40.	40 and upwards.
Ratio of deaths per 1,000 of mean strength	1872 ..	..	6·21	3·92	13·33	58·50	43·48
	1862–71	5·68	13·77	21·48	24·74	45·07	7·35

V.—ON THE HEALTH OF THE TROOPS SERVING IN THE WEST INDIES.

Section I

Sickness and Mortality.

[Windward and Leeward Command

STATISTICAL REPORT.

1. White Troops.

Windward and Leeward Command.

The force stationed in the West Indian Command during the year consisted of a Battery of Royal Artillery, six Companies of the 29th Regiment, a few non-commissioned officers of the 2nd West Indian Regiment, and details of the Royal Engineers and Army Hospital Corps in the Windward and Leeward Islands; and at Demerara, and a Battery of Royal Artillery, the remainder of the 29th Regiment, and a few similar details in Jamaica. On the 13th November No. 7 Battery, 3rd Brigade Royal Artillery, was relieved at Barbadoes by No. 6 Battery of the 7th Brigade from England; and on the 22nd of the same month No. 6 Battery of the 3rd Brigade was relieved at Jamaica by No. 5 Battery of the 7th Brigade.

The average strength in the Windward and Leeward Islands, and at Demerara, was 658, that at each of the stations occupied being as follows, Barbadoes 484·25, Trinidad 80·58, Saint Vincent 80·35, Demerara 12·91. The number admitted into Hospital was 624; and the deaths, including one of an invalid, at Netley, were 4. The proportion of admissions per 1,000 of the strength was therefore 948, and that of deaths 6·08, the former being 144, and the latter 3·10 above the corresponding ratio for 1871. The ratio of deaths was, however, 1·87 below that for the United Kingdom for 1872.

At Jamaica the average strength was 354, and the admissions and deaths were respectively 238, and 5, which represent a ratio of 672, and 14·12 per 1,000 of strength. The former is exactly the same as the corresponding ratio for 1871; the latter exceeds by ·61 the ratio of deaths for that year.

In Abstract No. 14 in the Appendix, the diseases by which the admissions and deaths were caused among the White troops stationed in the Windward and Leeward Islands, and in Jamaica, are shown separately; but as the two stations now form one command, and the force in it has been greatly reduced, the statistics of both have been included in the following Tables, framed from that Abstract:—

Windward and Leeward Command.

Orders.	Diseases.	1872: Strength, 1,012. Admitted.	Died. In West Indies.	Died. Of Invalids.	Died. Total.	1872: Ratio per 1,000. Admitted.	1872: Ratio per 1,000. Died.	1869–71. Ratio per 1,000. Admitted.	1869–71. Ratio per 1,000. Died.
	I. *General Diseases.*								
1	Febrile Group	130	2	..	2	128·5	1·97	185·0	4·63
2	Constitutional ,,	100	2	1	3	98·8	2·96	93·3	2·44
	II. *Local Diseases.* Diseases of the—								
1	Nervous System ..	5	1	..	1	4·9	·99	8·5	·73
2	Eye	12	..	..	..	11·9	..	12·7	..
3	Ear	11	..	..	..	10·9	..	6·3	..
4	Nose	1	..	..	..	1·0	..	·7	..
5	Circulatory System .	16	1	..	1	15·8	·99	9·3	1·46
6	Absorbent ,, ..	25	..	..	..	24·7	..	18·8	..
7	Ductless Glands ..	1	..	..	..	1·0	..	..	..
8	Respiratory ,, ..	26	..	..	..	25·7	..	30·9	..
9	Digestive ,, ..	112	..	..	..	110·7	..	76·9	·24
10	Urinary ,, ..	114	..	..	..	112·6	..	103·5	·24
11	Generative ,, ..	22	..	..	..	21·7	..	9·3	..
12	Organs of Locomotion	4	..	..	..	4·0	..	5·4	..
13	Cellular Tissue ..	18	..	..	..	17·8	..	20·0	..
14	Cutaneous System ..	83	..	..	..	82·0	..	83·5	..
	III. *Conditions, &c.*								
	Debility	16	..	..	..	15·8	..	6·1	..
	IV. *Poisons* ..	34	1	..	1	33·6	·99	25·8	·24
	V. *Injuries.*								
2	Accidental	132	1	..	1	130·4	·99	103·7	·24
4	Self-inflicted ..	..	..	..	..	..	..	·2	·24
	VI. *Surgical Operations*	..	..	..	..	..	..	·2	..
	No appreciable disease	..	..	..	..	..	..	·5	..
	Total	862	8	1	9	851·8	8·89	800·6	10·46
	Average of 10 years 1862–71	..	..	..	..	1064·6	16·47	..	..

The admissions were 51 per 1,000 of the strength above the average of the previous three years, and the deaths 1·57 below it. Both were much below the average of the previous ten years.

GENERAL DISEASES were considerably below the average as to prevalence, and much below it as to mortality, the reduction in both respects being confined to the febrile group. The admissions and deaths from the principal diseases of this class are shown in the following Table:—

Windward and Leeward Command.

General Diseases.	1872. Strength 1,012 Admitted.	1872. Strength 1,012 Died.	1872. Ratio per 1,000. Admitted.	1872. Ratio per 1,000. Died.	1869-71. Ratio per 1,000. Admitted.	1869-71. Ratio per 1,000. Died.
Febrile—						
Continued Fevers	98	1	96·8	·99	117·8	·73
Yellow Fever	4	1	4·0	·99	8·5	3·41
Paroxysmal Fevers	23	..	22·7	..	54·0	·49
Influenza	2	..	2·0	..	1·7	..
Erysipelas	1	..	1·0	..	1·5	..
Other Diseases of this group	2	..	2·0	..	1·5	..
Total	130	2	128·5	1·98	185·0	4·63
Constitutional—						
Rheumatism	21	..	20·8	..	14·6	..
Syphilis	62	..	61·2	..	65·7	..
Scrofula, Phthisis, &c.	11	3	10·9	2·96	9·0	2·43
Anæmia	5	..	4·9	..	1·5	..
Other Diseases of this group	1	..	1·0	..	2·4	..
Total	100	3	98·8	2·96	93·2	2·43

As, during the preceding year, there were no admissions for *Eruptive Fevers*, although small-pox prevailed to a serious extent among the civil population in several of the islands, and caused considerable mortality.

Continued Fevers, though rather more prevalent than in 1871, were below the average of the three preceding years, and most of the cases admitted are reported to have been of a very trivial nature. Among them, however, were included three cases of enteric fever, one at Barbadoes, one at Trinidad, and one at Jamaica. The last, which occurred in an Artilleryman, at Newcastle, proved fatal.

Yellow Fever.—From this formidable disease there were 4 admissions, and 1 death, all in Jamaica. The first case occurred on the 16th June, in the "General Penitentiary," at Kingston, in which the European military prisoners are confined, the man attacked being a gunner of the 6th Brigade Royal Artillery. The prisoners were at once removed, and placed under canvas at Up Park Camp, but on the 18th June two more cases occurred among them, and on the 21st the camp was moved to a site about three miles east of Kingston, and 1,600 feet above the level of the sea. After this date no more cases occurred among the prisoners, and on the 12th July they returned to the Penitentiary. All the cases which have been mentioned terminated favourably. The fourth case occurred in the end of September, in a Lance Corporal of the 29th Regiment, who had been employed as head porter at the brigade office at Kingston, and had occupied a quarter with a foul cesspool immediately under its window. He died three days after his seizure. The disease on this occasion did not spread farther.

Paroxysmal Fevers were much below the average as to prevalence, and no mortality resulted from them.

Rheumatism was rather above the average, but the amount of inefficiency caused by it was, as usual, very small.

Syphilis was below the average, and less prevalent than in 1871. Most of the admissions for it occurred at Barbadoes, where they were in the ratio of 80·58 per 1,000 of the strength. In Jamaica the ratio was 25·42, and in the Windward and Leeward Islands and Demerara together, it was 65·35.

Scrofula and Phthisis were rather more prevalent than in 1871, and the

Windward and Leeward Command.

ratio of admissions and deaths from them were little below those for the United Kingdom. They were much more prevalent at Barbadoes than in Jamaica, where only one case occurred, it, however, being a fatal one.

Local Diseases.—There was a decrease in diseases of the *nervous* and *respiratory systems*, and an increase in those of the *circulatory*, *digestive*, *urinary*, and *generative systems*, the increase being in all cases confined to the Windward and Leeward Islands. Affections of the *absorbent system* also were much more prevalent in the Windward and Leeward Islands than in Jamaica, there having been 24 admissions for them in the former, and only 1 in the latter. Dyspepsia and diarrhœa were the most prevalent diseases of the digestive system, gonorrhœa and its sequelæ of the urinary system, and orchitis of the generative system. The ratio of admissions per 1,000 of the strength from gonorrhœa and its sequelæ was 132·21 in the Windward and Leeward Islands, and 70·62 in Jamaica.

Poisons.—There was a large increase in the proportion of admissions under this head in both parts of the Command, 21 cases of "poisoning by alcohol," and 2 of delirium tremens, having been admitted in the Windward and Leeward Islands, and 10 of "poisoning by alcohol," and 1 of delirium tremens in Jamaica. Most of the cases returned as "poisoning by alcohol" occurred in the Artillery, and from the accounts given of them they appear to have been for the most part cases of sleeplessness and nervous irritability from excessive intemperance. The proportion of cases of delirium tremens was much below the average.

Injuries.—The proportion of admissions for accidental injuries was considerably above the average of the previous three years, but only one of them proved fatal, a case of fracture of the skull in an Artilleryman at Newcastle in Jamaica. The increase was chiefly in contusions, wounds, and sprains. There were no admissions for self-inflicted injuries during the year, and no deaths by suicide.

2.—Black Troops.

The Black Troops employed in the West Indian Command, including the Bahamas, Honduras, Demerara, the Windward and Leeward Islands, and Jamaica, consisted of the 1st West India Regiment, a wing of the 2nd West India Regiment, and a corps of African labourers, the latter being distributed between the islands of Barbadoes, Trinidad, and St. Vincent. The strength at the several stations was as follows:—Windward and Leeward Islands and Demerara, 635; Jamaica, 499; Bahamas, 145; Honduras, 193. The admissions and deaths at each, which are shown in detail, in Abstract No. 15 in the Appendix, were in the following proportions per 1,000 of the strength:—

	Ratio per 1,000 of Strength..	
	Admitted.	Died.
Windward and Leeward Islands, and Demarara	1012·6	9·45
Jamaica	1042·0	30·06
Bahamas	1393·1	6·90
Honduras	1487·0	31·09

The total strength in the Command was 1,472; the number admitted into Hospital during the year was 1,651; and the number of deaths was 28; the proportions per 1,000 of the strength represented by these numbers being, for

admissions 1,121·6, and for deaths 19·03, the former 106·1 above, and the latter 4·14 below the average for the preceding ten years. *Windward and Leeward Command.*

The classes and orders of diseases by which the admissions and deaths were caused, are shown in the following Table, framed from the Abstract above referred to :—

Orders.	Diseases.	1872. Strength 1,472. Admitted.	1872. Strength 1,472. Died.	1872. Ratio per 1,000. Admitted.	1872. Ratio per 1,000. Died.	1869–71. Ratio per 1,000. Admitted.	1869–71. Ratio per 1,000. Died.
	I. *General Diseases.*						
1	Febrile Group	265	..	180·0	..	147·5	2·30
2	Constitutional „	389	14	264·3	9·51	227·3	10·06
	II. *Local Diseases.*						
	Diseases of the—						
1	Nervous System	26	1	17·7	·68	21·6	1·88
2	Eye	30	..	20·4	..	16·1	..
3	Ear	6	..	4·1	..	1·3	..
4	Nose	2	..	1·4	..		..
5	Circulatory System	30	4	20·4	2·72	5·2	1·47
6	Absorbent „	32	..	21·7	..	17·4	..
8	Respiratory „	99	4	67·3	2·72	54·3	2·30
9	Digestive „	173	2	117·5	1·36	71·7	1·47
10	Urinary „	206	..	139·9	..	139·1	1·26
11	Generative „	33	..	22·4	..	17·6	..
12	Organs of Locomotion	13	..	8·8	..	10·3	·84
13	Cellular Tissue	20	..	13·6	..	19·3	..
14	Cutaneous System	104	..	70·6	..	77·9	..
	III. *Conditions, &c.*						
	Debility	15	..	10·2	..	2·1	..
	IV. *Poisons*	5	..	3·4	..	2·9	..
	V. *Injuries.*						
1	Battle	13	2	8·8	1·36	..	..
2	Accidental	184	..	125·0	..	85·5	·42
4	Self Inflicted	..	1	..	·68	·2	84
	VI. *Surgical Operations.*	6	..	4·1	..	·6	..
	No appreciable disease	..	..	..	..	·6	..
	Total	1,651	28	1121·6	19·03	918·5	22·84
	Average of 10 years, 1862-71..	..	..	1015·5	23·17	..	..

GENERAL DISEASES.—The admissions from both groups of this class considerably exceeded the average of the previous three years, but the mortality from it was lower by 2·85 per 1,000 of the strength. It is worthy of remark that throughout the Command there was not a single death from fever of any description during the year. The following Table shows the admissions and deaths from the principal diseases of this class :—

Windward and Leeward Command.

General Diseases.	1872. Strength 1,472. Admitted.	1872. Strength 1,472. Died.	1872. Ratio per 1,000. Admitted.	1872. Ratio per 1,000. Died.	1869–71. Ratio per 1,000. Admitted.	1869–71. Ratio per 1,000. Died.
Febrile Group—						
Eruptive Fevers	3	..	2·0	..	1·1	..
Continued „	61	..	41·5	..	10·0	·84
Yellow Fever	..	..	..	..	·8	·21
Paroxysmal „	195	..	132·5	..	95·5	1·25
Influenza	3	..	2·0	..	1·9	..
Erysipelas	..	..	..	..	·4	..
Other diseases of this group	3	..	2·0	..	7·8	..
Total	265	..	180·0	..	147·5	2·30
Constitutional Group—						
Rheumatism	118	1	80·2	·68	56·6	..
Syphilis	225	1	152·9	·68	142·6	·21
Scrofula, Phthisis, &c.	43	12	29·2	8·15	26·2	9·85
Anæmia	..	..	..	..	1·5	..
Other Diseases	3	..	2·0	..	·4	..
Total	389	14	264·3	9·51	227·3	10·06

Eruptive Fevers.—The cases admitted under this head were 2 of chicken pox in the 2nd West India Regiment at Barbadoes, and 1 of vaccination in the detachment of the same Regiment at Demerara.

Continued Fevers very slightly exceeded the average, their prevalence being greatest at Jamaica and Honduras; but they were for the most part slight, and nomortality was caused by them.

Paoxysmal Fevers considerably exceeded the average, the excess being due to the prevalence of ague at Demerara, and of remittent fever at Honduras; but from them also there was no mortality. There were no admissions for yellow fever, and none for cholera among the men, but a black woman, the wife of a soldier of the 1st West India Regiment, at Jamaica, was attacked by the latter disease on the 24th June, and two officer's children were similarly attacked a month later; all did well, and the disease did not spread further; all practicable sanitary precautions to prevent it from doing so, including evacuation of the infected quarters, having been adopted at once.

Rheumatism was in excess at Honduras and Demerara, and from its prevalence at those stations the ratio of admissions from it in the force generally exceeded the average of the previous three years by 23·6 per 1,000 of the strength.

Syphilis was greatly more prevalent than in 1871 at the Bahamas, and the ratio of admissions for it in the whole force was 10·3 per 1,000 of the strength above the average for the previous three years, and considerably more than double that among the White Troops in the same Command.

Scrofula and Phthisis caused 31 admissions and 10 deaths in the 1st West India Regiment at Jamaica, but only 12 admissions and 2 deaths in the remainder of the force. The report of the senior Medical Officer at Jamaica contains no information as to the causes of the excess in that island, but it was probably in part due to the arrival of invalids from other stations. In the whole Command the ratio of admissions from these diseases per 1,000 of the strength was 3·0 above the average for the preceding three years, and the ratio of deaths was 1·70 below it.

LOCAL DISEASES.—There was an increase in diseases of the *circulatory system*, most marked at Jamaica and Honduras, valve disease of the heart and palpitation being the particular affections in which it was chiefly observed,— in those of the *respiratory system*, from the prevalence of bronchitis in the Windward and Leeward Islands, and at Honduras,—and in those of the *digestive system*, from the prevalence of dyspepsia and bowel complaints in the Windward and Leeward Islands, and of the latter affections at Jamaica and Honduras. In the prevalence of diseases of the *urinary system* there was no change. The admissions for gonorrhœa were in the ratio of 119·56 per 1,000 of the strength. Affections of the *cutaneous system* were reduced in prevalence, and there were no admissions for guinea worm, which was prevalent in the Windward and Leeward Islands in 1871, among the men who had returned from the Coast of Africa. *Windward and Leeward Command.*

INJURIES.—In the gallant defence of the wooden barracks at Orange Walk, Honduras, on the 1st September, when that station was attacked by a strong force of Yeccachie Indians, one man of the small detachment 1st West India Regiment, forming the garrison, was killed, and 13 were wounded. All the wounds were by gunshot, the missile being in some instances a bullet, and in others a charge of slugs. Six were of the lower extremities, 2 of the upper, 3 of the chest (without penetration of the cavity), 1 of the back, and 1 of the abdomen. The last, which was a penetrating wound, proved fatal on the third day, but all the other wounded men did well, and with the exception of two who were sent to Jamaica for disposal, and remained under treatment at the end of the year, all had by that time returned to duty. The officer in command of the detachment, Lieutenant Smith, was wounded in the chest by two slugs or buckshot, one of which penetrated the cavity, and injured the lung. He also has recovered completely.

Accidental injuries were considerably above the average; contusions, wounds, and sprains, being the cause of the increase. There were 17 admissions for footsoreness in the Windward and Leeward Islands, 3 at Jamaica, and 1 at Nassau. One death by suicide occurred at Falmouth, Jamaica, under rather unusual circumstances, the man, a soldier of the 1st West India Regiment, having managed to shoot himself while a prisoner in the guard room.

SANITARY REPORT.

Deputy Inspector-General Prendegast reports:—

The health of the white troops, without exception, has been very good.

The force during the year at Barbadoes, consisted of the head-quarters of the 29th Regiment, and the 7th Battery, 3rd Brigade, Royal Artillery; the latter was relieved on the 14th November by the 6th Battery, 7th Brigade. The average strength of the troops at St. Ann's was 484·25, and the daily average sick 21·47. Three fatal cases occurred, all in the 29th Regiment. All the cases of fever treated were unimportant, and yielded readily to the treatment adopted.

Black Troops.—The detachment 2nd West India Regiment, and Corps of Military Labourers, quartered at St. Ann's, have enjoyed good health.

The barracks have been in good condition; but some improvements, which were alluded to in my last report, are necessary on sanitary grounds.

The Report of the Senior Medical Officer at Jamaica has the following remarks:—

On the 16th June, yellow fever appeared in the General Penitentiary, where the European military prisoners are confined. The first attacked was a gunner of the Royal Artillery, and on the following day the remainder of the European military prisoners were placed under canvas at Up-Park Camp, and there, on the 18th, two more were attacked. On the 21st, the prisoners were encamped on a mountain two or three miles off, and about 1,600 feet above the level of the sea. After this no fresh cases occurred, and, on the 12th July, the prisoners returned to the Penitentiary.

At the latter end of September, a Lance-Corporal of the 29th Regiment employed as head porter in the Brigade Office, Kingston, was attacked with

Windward and Leeward Command.

yellow fever, which proved fatal on the third day. A cesspool was close under the window of the room occupied by this man, and as the quarters were deemed unfit for Europeans to occupy, they were condemned by a Board of Officers, and such Europeans as occupied quarters in the Head-Quarter Offices were placed on the lodging list; the cesspool was emptied, lime thrown into it; the forms whitewashed, and every precaution taken to prevent the spread of the disease. Three cases of cholera occurred amongst the women and children during the past year. On the 24th June, a black woman was attacked with Asiatic cholera. The precautions taken to prevent its spread were attended with success; the quarters were at once vacated by the married people, and re-occupied early in July. On the 24th July, two officers' children were stated to have been attacked with this disease; the cases, however, were apparently of a very mild character, and made good recoveries.

Section II.

On the Extent of Invaliding.

Windward and Leeward Command and Western Africa.

The number of invalids sent home during the year from the West Indies was 20; the number finally discharged at Netley was 9. Of the black troops serving in the West Indies and Western Africa, 30 were discharged as invalids during the year.

The following Table shows the classes of diseases by which the invaliding was caused; the details are given in Abstracts Nos. 14 and 15 of the pendix :—

	White Troops.		Black Troops.
	Windward and Leeward Command.		West Indies and Western Africa.
Mean Strength	1,012.		1,850.
Classes of Disabilities.	Invalids sent Home.	Discharged as Invalids at Netley.	Discharged as Invalids in the Colonies
I. *General Diseases.*			
Febrile Group	1	..	..
Constitutional Group	3	2	18
II. *Local Diseases.*			
Diseases of the—			
Nervous System	1	1	5
Circulatory „	3	3	1
Respiratory „	2	1	1
Digestive „	3	1	4
Generative „	1	..	..
Organs of Locomotion ..	..	1	..
Cutaneous System	1	..	1
III. *Debility*	5	..	..
General Total	20	9	30
Ratio per 1,000 of { 1872 ..	19·76	8·99	16·22
Mean Strength .. { 1862-71	31·78	17·58	16·90

Compared with the results of 1871, there was a considerable increase in the ratio of invalids sent home from the West Indies, and a considerable decrease in the ratio of those finally discharged from the service at Netley. Debility furnished a larger number of invalids than any of the other classes, and diseases of the circulatory system the greatest number finally discharged the service. The proportion of black troops discharged the service was high, nearly two-thirds being invalided for constitutional affections. *Windward and Leeward Command, and Western Africa.*

Section III.

Mean Daily Sick.

The average number of European troops constantly non-effective from sickness during the year 1872, in the West Indies, was 35·51 ; and of black troops in the same command 87·28. The following Table gives the usual information calculated upon these numbers :— *Windward and Leeward Command.*

		White Troops.	Black Troops.
		Windward and Leeward Command.	Windward and Leeward Command.
Ratio per 1,000 constantly Sick.	1872 ..	35·09	59·29
	1862–71 ..	46·03	53·26
		days.	days.
Mean sick time to each Soldier.	1872 ..	12·81	21·64
	1862–71 ..	16·80	19·44
Average duration of the Cases.	1872 ..	15·04	19·29
	1862–71 ..	15·78	19·04

Compared with the results for 1871, there has been an increase in the mean daily sick, both of the white and black troops, in the West Indies. The average duration of the cases, however, was shorter, and for the white troops below, but for the black a little above, that of the preceding ten years.

Section IV.

The following returns show the numbers serving on the 1st January, and the deaths in each quinquennial period of life in 1872 :—

Windward and Leeward Command, and Western Africa.

Corps.	Under 20 Years.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.	
	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.
WHITE TROOPS.												
Royal Artillery	3	...	14	1	18	1	7	...	6	...	2	1
29th Regiment	139	1	248	3	213	...	88	2	31	...	5	...
Total, White Troops ...	142	1	262	4	231	1	95	2	37	...	7	1
Ratio per 1,000 of Mean Strength { 1872 ...	7·04		15·27		4·33		21·05		...		142·86	
Ratio per 1,000 of Mean Strength { 1862–71 ...	...		4·76		13·10		14·61		35·29		50·00	
BLACK TROOPS..												
1st West India Regiment ...	92	3	179	7	298	9	127	2	14	1	8	...
2nd " " ...	110	1	331	9	273	3	104	3	58	2	9	...
Military Labourers	9	...	67	...	57	2	26	1	14	...	5	...
Total, Black Troops ...	211	4	577	16	628	14	257	6	86	3	22	...
Ratio per 1,000 of Mean Strength { 1872 ...	18·96		27·73		22·29		23·35		34·88		...	
Ratio per 1,000 of Mean Strength { 1862–71 ...	10·66		23·15		27·96		20·20		26·05		40·89	

VI.—ON THE HEALTH OF THE TROOPS SERVING IN WESTERN AFRICA.

Section I.

Sickness and Mortality.

STATISTICAL REPORT.

Western Africa.

THE average strength of the white non-commissioned officers serving with the detachment of the 2nd West India Regiment in Western Africa was 1·9. Sierra Leone being the only station at which they were present during any part of the year. They furnished 4 admissions into hospital, 2 for malarious fever, 1 for bronchitis, and 1 for ulcer, but no deaths; and 2 were invalided, 1 for debility, the other for secondary syphilis.

The black troops consisted of the left wing of the 2nd West India Regiment, of which 2 companies were stationed at Sierra Leone, and the other 2 occupied the several stations on the Gold Coast, viz. (in their order from east to west), Accra, Cape Coast Castle, Elmina, Seecondee, Dixcove, and Axim The occupation of the last four became necessary on their transfer by the Dutch Government on the 6th of April.

The average strength of the black troops in the command was 378; their admissions into hospital were 629; the deaths among them were 15; and the number constantly sick was 28·44. These numbers represent the following ratios per 1,000 of the strength. Admissions 1,664; deaths 39·68; constantly sick 75·24.

The average strength at Sierra Leone was 207; the admissions into hospital there were 426; the deaths 9; and the average number constantly sick 15·48; the ratio per 1,000 of the strength represented by these numbers being, for admissions, 2,058; for deaths 43·48; and for constantly sick 74·78.

Western Africa.

At the stations on the Gold Coast the average strength was 171; the admissions were 203; the deaths 6; and the average number constantly sick 12·96; the ratios per 1,000 of the strength being, therefore, for admissions, 1,187; for deaths 35·09; and for constantly sick 75·79.

The following Table, framed from Abstract No. 15 in the Appendix, shows the admissions and deaths caused by each class and order of diseases:—

Order.	Black Troops.	1872.				1869–71.	
	Diseases.	Mean Strength, 378.		Ratio per 1,000.		Ratio per 1,000.	
		Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
	I. *General Diseases.*						
1	Febrile Group	285	3	754·0	7·93	318·0	9·48
2	Constitutional „	90	6	238·1	15·87	256·6	6·32
	II. *Local Diseases.*						
	Diseases of the—						
1	Nervous System	5	1	13·2	2·65	12·0	2·53
2	Eye	4	..	10·6	..	25·3	..
3	Ear	..	..	..	..	3·2	..
4	Nose	1	..	2·6	..	..	..
5	Circulatory System ..	2	1	5·3	2·65	6·3	·63
6	Absorbent „ ..	5	..	13·2	..	13·9	..
8	Respiratory „ ..	33	2	87·3	5·29	58·8	3·79
9	Digestive „ ..	45	2	119·1	5·29	122·6	5·69
10	Urinary „ ..	48	..	127·0	..	134·0	1·89
11	Generative „ ..	11	..	29·1	..	20·2	..
12	Organs of Locomotion ..	5	..	13·2	..	12·0	·63
13	Cellular Tissue	10	..	26·5	..	51·2	1·27
14	Cutaneous System ..	49	..	129·6	..	116·3	..
	III. *Conditions, &c.*						
	Debility	1	..	2·6	..	2·5	..
	IV. *Poisons.*	1	..	2·6	..	·6	..
	V. *Injuries.*						
2	Accidental	32	..	84·7	..	97·4	1·27
	IV. *Surgical Operations* ..	2	..	5·3	..	..	..
	Diseases not stated ..	..	..	..	..	3·2	..
	Total	629	15	1664·0	39·68	1254·1	33·50
	Average of 10 years 1862-71	..	..	1351·4	37·62	..	..

The ratio of admissions was considerably lower than that for the preceding year; but the ratio of deaths was more than twice as high. Both were considerably above the average of the previous 10 years, and also above that of the immediately preceding three years.

General Diseases caused 596 per 1,000 of the admissions, and nearly two-third of the deaths. The admissions for diseases of the febrile group were in a lower ratio than in 1871, but more than twice the average of the preceding three years. The mortality from them was below the average. With the exception of one case of small-pox, which occurred at Sierra Leone, all the admissions were from ague and remittent fever. The ratio of admis-

Western Africa.

sions for diseases of the constitutional group was almost the same as that for 1871, and considerably below the average of the previous three years; but the ratio of deaths from them was more than twice the average. The excess was due to the prevalence and fatality of phthisis, from which all the deaths occurred. The admissions for *rheumatism* amounted to 111·1, and those for *syphilis* to 92·6 per 1,000 of the strength, the former being below, and the latter above the corresponding ratio for 1871.

LOCAL DISEASES.—There was a considerable reduction in the prevalence of *diseases of the eye*, in that of affections of the *digestive system*, more particularly dysentery and diarrhœa, from which, however, the mortality was higher, and in that of *urinary* diseases. The ratio of admissions for gonorrhœa and its sequelæ was 121·7 per 1,000 of the strength. There was a considerable decrease in affections of the *cellular tissue*, but an equal increase in *diseases of the skin*.

INJURIES.—There were no deaths from either accidental or self inflicted injuries, and there was a reduction in the admissions for the former.

SANITARY REPORT.

Surgeon-Major Rowe remarks, with regard to the prevalence of fever, that as these attacks are due to climate, and affect new comers, no matter what their nation, and as troops from the West Indies suffer invariably much more on first arrival than they do subsequently, he is of opinion that the diminution of cases of fever is distinctly traceable to a species of acclimatization, and it becomes a matter for serious consideration whether the present tour of service of three years might not be prolonged with advantage so far as the Negro troops are concerned.

This measure would in no way affect the stay of their officers.

The sanitary state of the barracks (both officers' and men's quarters) has been very materially improved by the new roof to the left wing, and the general repairs to the whole of the Castle.

The Colonial authorities have promised to carry out the recommendations of the Senior Medical Officer as to the alterations to be made in the fort at Axim. These will give increased accommodation, and much increased ventilation. The detachment at Seccondee will be removed to Axim.

The officers appear to have suffered more than the men at the outposts; and, among other reasons, this is believed to be due to the fact that, at the out-stations, the men receive rations, whereas the officers receive a pecuniary allowance in lieu thereof, and, being away from mess, suffer considerably from change of diet and discomfort. The monotony of their lives at the outpost is also disadvantageous. In all three instances, however, of invaliding, the officers have been combatant and not medical; and in all the cases they had long exceeded their time of African service.

Section II.

On the Extent of Invaliding.

The troops in Western Africa are included with the black troops in the West Indies, in Section II. of the report on the latter station, in which the invaliding in the whole of the black troops is shown.

Section III.

Mean Daily Sick.

The average number constantly sick during the year was 28·44, which represents a ratio of 75·24 per 1,000 of the strength, being 1 per 1,000 below the ratio for 1871. The usual calculations on these numbers show the average period during which each soldier was inefficient from sickness to have been 27·46 days, and the average duration of the cases 16·50 days, the former being very slightly lower, and the latter considerably higher than the corresponding results for 1871. *Western Africa.*

Section IV.

Influence of Age on Mortality.

The troops on the Coast of Africa are included with the black troops in the West Indies in the table on page 90 in which the influence of age on mortality in the whole force is shown.

VII.—ON THE HEALTH OF THE TROOPS SERVING AT THE CAPE OF GOOD HOPE AND ST. HELENA.

Section I.

Sickness and Mortality.

STATISTICAL REPORT.

On the 15th August, 1872, No. 4 Battery, 2nd Brigade Royal Artillery, stationed at Cape Town, and Fort Napier, Natal, was relieved at those stations by No. 5 Battery of the same Brigade, from Mauritius; and on the 19th September the Head-Quarters Staff, and Band of the 32nd Light Infantry, amounting in all to 51 men, arrived at East London from the same colony. With these exceptions there was no change in the constitution of the force stationed at the Cape of Good Hope during the year. The Infantry Regiments employed there were the 32nd, the 75th, and the 86th. *Cape of Good Hope and St. Helena.*

The troops at St. Helena consisted of the 7th Company Royal Engineers, and a Battery of the 2nd Brigade Royal Artillery, No. 5 Battery being that present during the first three quarters of the year, and No. 2 during the last quarter.

The average strength of the troops at the two stations during the year was 2,484; the admissions into hospital were 2,479; and the deaths, including 4 of invalids at Netley, were 23. The ratios per 1,000 of the strength represented by these numbers are, for admissions 998, and for deaths 9·25, the former slightly above, and the latter below the corresponding ratio for 1871. Both are considerably below the average for the three immediately preceding years, and that for the ten years from 1862 to 1871.

The following Table, framed from Abstract No. 16 in the Appendix, shows the admissions and deaths from the different classes and orders of diseases, with their ratios per 1,000 of the strength:—

Cape of Good Hope and St. Helena.

Order.	Diseases.	1872. Mean Strength, 2,484. Admitted.	Deaths. In Command.	Deaths. Of Invalids.	Deaths. Total.	Ratio per 1,000. Admitted.	Ratio per 1,000. Died.	1869–71. Annual Ratio per 1,000 of Strength. Admitted.	Died.
	I. *General Diseases.*								
1	Febrile Group ..	305	3	..	3	122·8	1·21	104·5	·81
2	Constitutional „ ..	444	3	2	5	178·7	2·01	210·2	3·25
	II. *Local Diseases.*								
	Diseases of the—								
1	Nervous system	20	2	..	2	8·0	·80	12·4	1·42
2	Eye	89	..	..	..	35·8	..	43·8	..
3	Ear	16	..	..	..	6·5	..	3·3	..
4	Nose	..	..	..	..	..	..	·6	..
5	Circulatory system ..	20	2	..	2	8·0	·80	10·5	1·32
6	Absorbent „ ..	66	..	..	..	26·6	..	15·5	..
8	Respiratory „ ..	73	3	..	3	29·4	1·21	38·2	·61
9	Digestive „ ..	425	2	1	3	171·1	1·21	142·1	2·13
10	Urinary „ ..	388	..	1	1	156·2	·40	217·9	·10
11	Generative „ ..	44	..	..	..	17·7	..	17·1	..
12	Organs of Locomotion ..	15	..	..	..	6·0	..	6·1	·20
13	Cellular Tissue	48	..	..	..	19·3	..	24·5	..
14	Cutaneous system ..	224	..	..	..	90·2	..	93·6	..
	III. *Conditions, &c.*								
	Debility	16	1	..	1	6·5	·40	8·8	·20
	IV. *Poisons* ..	22	..	..	..	8·9	..	10·7	·61
	V. *Injuries.*								
2	Accidental	258	3	..	3	103·9	1·21	134·0	1·12
3	Homicidal	..	..	..	..	..	..	..	·10
4	Self-inflicted	1	..	..	..	·4	..	·4	·20
	VI. *Surgical Operations*	1	..	..	..	·4	..	·6	..
	No appreciable disease ..	4	..	..	..	1·6	..	1·3	..
	Total	2,479	19	4	23	998·0	9·25	1096·1	12·07
	Average of 10 years, 1862-71	..	..	..	..	1009·0	10·82	..	..

GENERAL DISEASES.—The admissions for diseases of the febrile group were in a considerably higher ratio than in 1871, and above the average of the three previous years. Those for diseases of the constitutional group were below the average, and in a lower ratio than in 1871. The following Table shows the admissions and deaths from the principal diseases of this class :—

Cape of Good Hope and St. Helena.

General Diseases.	1872. Mean Strength, 2,484. Admitted.	Deaths. In Command.	Deaths. Of Invalids.	Deaths. Total.	Ratio per 1,000 Admitted.	Ratio per 1,000 Died.	1869-71. Annual Ratio per 1,000 of Strength. Admitted.	Died.
Febrile—								
Eruptive Fevers	3	..	..	..	1·2	..	1·5	..
Continued „	57	..	..	..	23·0	..	52·2	·51
Paroxysmal „	143	3	..	3	57·6	1·21	32·1	·20
Influenza	91	..	..	..	36·6	..	14·9	..
Erysipelas	7	..	..	..	2·8	..	2·6	·10
Other Diseases of this Group ..	4	..	..	..	1·6	..	1·2	..
Total	305	3	..	3	122·8	1·21	104·5	·81
Constitutional—								
Rheumatism	66	..	..	..	26·6	..	41·6	·10
Syphilis	349	..	..	..	140·5	..	157·3	·31
Scrofula, Phthisis, &c.	24	3	2	5	9·6	2·01	9·7	2·84
Scurvy and Purpura	1	..	..	..	·4	..	..	..
Anæmia	1	..	..	..	·4	..	·7	..
Other Diseases of this Group ..	3	..	..	..	1·2	..	·9	..
Total	444	3	2	5	178·7	2·01	210·2	3·25

Eruptive Fevers.—The only admissions under this head were 3 from scarlet fever, in the 86th Regiment at Cape Town, the disease in each case being in a mild form. There were also three cases among the children, one of them fatal.

Continued Fevers were much less prevalent than in 1871, and greatly below the average. No mortality was caused by them. One case of enteric fever occurred in the 86th at Cape Town. The remainder of the admissions were for simple continued fever, and febricula, and all occurred at the Cape. There were no admissions for continued fever at St. Helena.

Paroxysmal Fevers, on the other hand, were much more prevalent than in 1871, and greatly above the average; the excess, however, was due entirely to the prevalence of relapses among men who had been stationed at Mauritius, Hong Kong, or Singapore, and had contracted their diseases there.

Influenza continued to prevail to an unusual extent in the 86th Regiment at Cape Town, and, as during the previous year, was attributed by the medical officer in charge, to the frequent and sudden changes of temperature at that station. There were no admissions for it among the officers, women, and children; and it may be mentioned that the admissions for bronchitis in the 86th Regiment were much below the average, and did not amount to the eighth part of those for influenza. Of 91 admissions for the latter disease in the Command, 76 were in that Regiment.

Rheumatism was less prevalent than in 1871, and below the average.

Syphilis, though less prevalent than in 1871, and considerably below the average of the previous three years, still furnished a very high ratio of admissions. It prevailed chiefly at Cape Town, where a "Contagious Diseases Act" was in force during a portion of the year, but so inefficiently carried out that it was entirely inoperative, and its subsequent repeal formed no subject for regret. The ratio of admissions for primary and secondary syphilis per 1,000 of the strength was 275·9 in the 86th at Cape Town, 73·3 in the 32nd at King William's Town, and 67·3 in the Troops at St. Helena.

Cape of Good Hope and St. Helena.

Scrofula and Phthisis caused twice as many admissions as in 1871, but almost the same mortality, the ratio of the former per 1,000 of the strength being almost identical with the average for the previous three years, and that of deaths below it. There were no admissions for these diseases at St. Helena.

Local Diseases.—The most important changes in the prevalence of diseases of this class were a considerable increase in the admissions for those of the *digestive* system, and a reduction in those for *urinary* affections. The reduction in the latter took place chiefly in gonorrhœa, from which and its sequelæ, the admissions were on the following proportions per 1,000 of the strength in the different parts of the Command,—Cape Town 228, Eastern Frontier and Natal 49·6, St. Helena 330. The increase in diseases of the digestive system was confined to dyspepsia, the result in many cases of intemperance. There was a large reduction in the prevalence of dysentery, and the mortality from the order, as a whole, was much below the average.

Poisons.—The admissions for delirium tremens were nearly twice as numerous as in 1871, but there were no deaths from that disease. Of 22 admissions for it 2 were at St. Helena, 2 at Cape Town, and the remainder on the Eastern Frontier or at Natal. The surgeon of the 32nd Regiment at King William's Town attributes a large proportion of the sickness and crime in that Regiment to the excessive prevalence of intemperance at all the stations on the Eastern Frontier, from the cheapness and abundance of "Cape brandy," an impure and noxious spirit manufactured there.

Injuries.—Accidental injuries were considerably below the average, but there were three deaths by drowning, two at King William's Town, and one at Pietermaritzburg. These accidents are believed to have been the result of intemperance. The men were returned as "found drowned." There were no deaths by suicide.

SANITARY REPORT.

Deputy Inspector-General Heffernan reports :—

According to the reports of the Medical Officers generally in the division, the health of the troops does not appear to have been injuriously affected by any special causes arising out of the sanitary state of the quarters, though defects are noticed. The construction of the latrines and urinals generally is objectionable, and the bath accommodation is rather deficient. Difficulties have occurred about the supply of water at the garrison hospital at Cape Town, but means have been adopted to increase the supply. The sanitary state of the command generally is much the same as in previous years. Such, however, is the natural salubrity of the climate, that the health of the men has improved. The admissions and deaths are less, in proportion to the strength, than they were last year. Ague and remittent fever prevailed in the 75th Regiment, quartered in Natal and King William's Town, but these diseases were the result of a previous residence of the regiment in Hong Kong and Singapore, and are not to be considered as due to the effects of this climate. With the exception of venereal affections, there was very little serious disease.

As regards the prevalence of venereal affections, it may be remarked that the Contagious Diseases Act was repealed at the end of the first half of the year.

Section II.

On the Extent of Invaliding.

During the year there were 49 invalids sent home from this Command, being in the ratio of 19·74 per 1,000 of mean strength ; 32, or 12·89 per 1,000, were discharged the service at Netley.

The disabilities for which the men were invalided are detailed in Abstract No. 17 in the Appendix, from which the following classified summary has been framed :—

Cape of Good Hope and St. Helena.

Disabilities.	Invalids sent to England from Cape and St. Helena.	Invalids Discharged the Service at Netley.
I. *General Diseases.*		
Constitutional Group	19	14
II. *Local Diseases.*		
Diseases of the—		
Nervous System	3	1
Eye	4	4
Circulatory System	4	4
Respiratory „	4	..
Digestive „	6	4
Urinary „	1	..
Organs of Locomotion	1	3
Cutaneous System	2	1
III. *Debility*	3	..
V. *Injuries.*		
Accidental..	2	1
Total	49	32
Ratio per 1,000 of Mean Strength.. .. { 1872 ..	19·74	12·89
{ 1862–71 ..	29·23	20·50

A slightly increased ratio of invaliding occurred in this Command when compared with that of 1871. Constitutional affections furnished a very large proportion not only of invalids but also of those finally discharged the service.

Section III.

Mean Daily Sick.

The average number constantly sick during the year was 104·92, or 45·20 per 1,000 of the strength, at the Cape of Good Hope, and 7·16, or 43·82 per 1,000 of the strength, at St. Helena. In the command as a whole the number constantly sick was 112·08, or 45·12 per 1,000 of the strength, which is 1·43 above the ratio for the preceding year, but 5·58 below that for the previous ten years. The following Table gives the usual results calculated from these numbers:—

	1872.	1862–71.
Ratio per 1,000 of Strength constantly Sick..	45·12	50·70
	days.	days.
Average Sick time to each Soldier	16·47	18·50
Average duration of cases of Sickness	16·50	18·34

Both ratios are slightly above those for the preceding year, but considerably below the average of the previous ten years.

Section IV.

Influence of Age on Mortality.

Cape of Good Hope and St. Helena.

The following return shows the influence of age in quinquennial periods, on the mortality of the troops serving at the Cape and St. Helena:—

	Under 20.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.	
	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.
Engineers	3	...	20	...	24	...	9	...	21	1	6	
32nd Foot	37	...	404	...	293	1	90	1	50	1	2	...
86th „	196	...	249	1	139	2	131	2	85	3	63	...
75th „	16	...	304	3	239	2	160	2	86	3	20	...
Total	252	...	977	4	695	5	390	5	242	8	91	...
Ratio per 1,000 of Mean Strength ... 1872 ...	...		4·07		7·19		12·82		33·06		...	
Ratio per 1,000 of Mean Strength ... 1862-71	1·21		6·41		11·43		17·82		19·67		17·20	

The results of the year show a gradual increase of mortality with age up to 35 years, but in each period a considerably lower average than that of the preceding ten years; between 35 and 40 however the increase was very marked, and much above the average.

VIII.—ON THE HEALTH OF THE TROOPS SERVING IN THE ISLAND OF MAURITIUS.

Section I.

Sickness and Mortality.

STATISTICAL REPORT.

Mauritius.

The changes in the constitution of the force at Mauritius during the year were the relief of No. 2 Battery of the 2nd Brigade, R.A., by No. 4 Battery of the same Brigade from St. Helena and the Cape on the 20th September, and the transfer during the same month of the Head-Quarters Staff and Band of the 32nd Light Infantry to the Cape. The 24th Company of the Royal Engineers, and a wing of the 32nd Light Infantry remained in the island throughout the year. The average strength of the whole was 469; the admissions into hospital were 695; and the deaths, including one of an invalid at sea on the voyage home, were three. The proportions per 1,000 of the strength represented by these numbers are, for admissions 1 81·8, and for deaths 6·39, the former greatly above, and the latter greatly below the corresponding ratio for 1871.

The following Table, framed from Abstract No. 16 in the Appendix, shows the admissions and deaths from the various classes and orders of diseases:—

Order.	Diseases.	Strength, 469.				1872.		1869–71.	
		Admitted.	Died.			Ratio per 1,000.		Ratio per 1,000.	
			At Mauritius.	Of Invalids.	Total.	Admitted.	Died.	Admitted.	Died.
	I. *General Diseases.*								
1	Febrile Group ..	390	1	..	1	831.5	2·13	714·3	4·05
2	Constitutional „ ..	48	1	..	1	102·3	2·13	121·5	2·89
	II. *Local Diseases.*								
	Diseases of the—								
1	Nervous System ..	5	..	..	..	10·7	..	8·1	1·16
2	Eye	5	..	..	..	10·7	..	14·5	..
3	Ear	9	..	..	..	19·2	..	4·6	..
5	Circulatory System ..	1	..	1	1	2·1	2·13	9·3	1·74
6	Absorbent „ ..	9	..	..	..	19·2	..	11·0	..
8	Respiratory „ ..	11	..	..	..	23·4	..	41·6	·58
9	Digestive „ ..	76	..	..	..	162·0	..	207·1	2·31
10	Urinary „ ..	27	..	..	..	57·6	..	74·0	..
11	Generative „ ..	5	..	..	..	10·7	..	13·3	..
12	Organs of Locomotion ..	1	..	..	..	2·1	..	4·0	..
13	Cellular Tissue	8	..	..	..	17·0	..	16·8	..
14	Cutaneous System ..	33	..	..	..	70·4	..	65·4	..
	III. *Conditions, &c.*								
	Debility	6	..	..	..	12·8	..	4·0	..
	IV. *Poisons* ..	6	..	..	..	12·8	..	23·1	2·31
	V. *Injuries.*								
2	Accidental	55	..	..	..	117·3	..	77·5	..
	VI. *Surgical Operations*	..	..	..	..	..	..	·6	..
	Total	695	2	1	3	1481·8	6·39	1410·7	15·04
	Average of 10 years, 1862–71	..	..	..	..	1116·9	21·13	..	..

Compared with the results for 1871, there was an increase of 481·8 per 1,000 of the strength in the ratio of admissions, and a decrease of 8·36 in that of deaths. Compared with those for the three immediatly preceding years there was an increase of 71·1 in the ratio of admissions, and a decrease of 8·65 in that of deaths. And compared with those for the 10 years from 1862 to 1871, there was an increase of 364·9 in the ratio of admissions, and a decrease of 14·74 in that of deaths.

General Diseases.—There was a very large increase in the admissions for diseases of the febrile group, which were nearly twice as numerous as in 1871, and exceeded by 117·2 per 1,000 of the strength the average for the three years from 1869 to 1871; but, as during the preceding year, there was only one death from fever. The admissions for diseases of the constitutional group were fewer than in 1871, and below the average. From them also there was but one death.

The following Table shows the admissions and deaths from the principal diseases of this class:—

Mauritius.

General Diseases.	Strength, 469.				Annual Ratio per 1,000 of Strength.			
		Deaths.			1872.		1869–71.	
	Admitted.	In Mauritius.	Of Invalids.	Total.	Admitted.	Died.	Admitted.	Died.
Febrile—								
Continued Fevers	19	..	..	..	40·5	..	38·7	..
Paroxysmal „	368	1	..	1	784·6	2·13	665·7	3·47
Influenza	2	..	..	..	4·3	..	8·1	..
Erysipelas	..	..	..	..	..	..	1·2	..
Other Diseases of this group ..	1	..	..	..	2·1	..	·6	·58
Total	390	1	..	1	831·5	2·13	714·3	4·05
Constitutional—								
Rheumatism	15	..	..	..	31·9	..	35·9	..
Syphilis	27	..	..	..	57·6	..	60·7	..
Scrofula, Phthisis, &c.	3	1	..	1	6·4	2·13	11·6	2·89
Scurvy and Purpura	1	..	..	..	2·1	..	..	..
Anæmia	2	..	..	..	4·3	..	13·3	..
Total	48	1	..	1	102·3	2·13	121·5	2·89

Continued Fevers were less prevalent than during the preceding year, but slightly above the average of the previous three years. With the exception of one case of enteric fever in a young soldier of the Artillery, recently arrived from England, all the admissions were for febricula.

Paroxysmal Fevers were more than twice as prevalent as in 1871, and considerably above the average of the three years from 1869 to 1871, the admissions for them being in a higher ratio than in any year since 1869. Only one case, however, proved fatal among the troops. The increased prevalence of malarial fevers began in February, and is attributed by the Principal Medical Officer to the effects of a hurricane, accompanied by very heavy rain, which passed over the island in that month, and "the abnormal meteorological conditions which followed it," the chief among these being apparently an unusually heavy rainfall throughout the year. Their greatest prevalence was at Mahebourg and the Rifle Camp at Point D'Esney, from which it was found necessary in the begining of August to remove nearly all the men to Port Louis. The ratio of admissions was highest in the Royal Engineers, next in the Artillery, and lowest in the 32nd Regiment. The attacks are reported to have been generally mild, but in many cases attended at first by considerable gastric and intestinal disturbance, and in nearly all followed by asthenia and an anæmic condition, slowly recovered from. Surgeon Lofthouse of the 32nd Regiment, however, states that the disease in some instances assumed a pernicious or malignant form, and that in such cases the subcutaneous injection of quinine was found to be more efficacious than any other remedy. "Therapeutically," he states, "its power and efficacy were surprising "in cases of fever attended with coma or convulsions, either in adults or in "children, consciousness quickly returning on its employment, after the "failure of other medicines." The solvent used was tartrate of potash, and unpleasant local effects are mentioned as having ensued in a few instances.

Relapses were of frequent occurrence, and nearly the half of the admissions appear to have resulted from them. After May the great majority of the admissions were for relapses. In the 32nd Regiment, very young men suffered in a far

higher ratio than those of more mature age. In men under 20 the proportion of attacks per cent. of the strength was 250; in those between 20 and 30 it was 40·82; and in those above 30 it was 49·09. The proportion of attacks was also much higher among the men of that regiment who occupied the lower rooms in barracks than among those who occupied the upper rooms. During the period from the 1st January to the 9th April, the only one for which a return is given, 76·71 per cent. of the men admitted came from the lower-rooms, and only 23·29 per cent. from the upper rooms. The numbers occupying the lower and upper rooms respectively are, however, not stated. *Mauritius.*

Only five men were invalided for malarious fever during the year.

Rheumatism was rather less prevalent than during the preceding year, and *syphilis* rather more so, though below the average of the previous three years. The admissions for primary and secondary syphilis were in the ratio of 57·57 per 1,000 of the strength.

Only three men were admitted for phthisis, but of these one died in hospital, and two were invalided. Surgeon-Major Small, the Principal Medical Officer, records his opinion, the result of a long experience of the island, that its climate is most unfavourable for men suffering from tubercular diseases, which there, he states, soon assume a condition of rapidly fatal activity.

Local Diseases.—There was a reduction in the prevalence of diseases of the *circulatory, digestive,* and *urinary systems,* and an increase in that of diseases of the *ear,* and the *nervous* and *absorbent systems.* The admissions for gonorrhœa and its sequelæ were in the ratio of 206·82 per 1,000 of the strength.

Poisons.—There were five admissions for delirium tremens, giving a ratio of 10·7 per 1,000 of the strength, and one for alcholic poisoning; but there were no deaths from this cause.

Accidents.—The proportion of admissions for accidental injuries was higher than in 1871, and much above the average, but none of the injuries were fatal. Sprains and contusions formed the great majority of them. There were no deaths by suicide, or admissions for self-inflicted injuries.

SANITARY REPORT.

Surgeon-Major Small, the Senior Medical Officer, remarks:—

The only change which has taken place during the past year in the constitution of the troops serving in the Island, has been the relief, on the 20th September, of the 2nd Battery, 2nd Brigade, Royal Artillery, by the 4th Battery of the same Brigade, from St. Helena and the Cape, also by the transfer to the latter station of the Head-Quarter Staff, 32nd Regiment.

Except as regards the increase of malarious fever attacks, an increase which brings up the sick list in this respect to nearly the same proportion as in 1869, the same general observations might be made in regard to the health of the troops serving in Mauritius, as were contained in the Sanitary Report for last year, 1871.

The recrudescence of poludal fever, above noted, occurred among the men of the 32nd Regiment, stationed at Mahebourg, and the Royal Engineers located at the Rifle Camp of Port D'Esney in the same district. It was at its height in May, the civil population in all the lower levels of that district (Grand Port) suffering much from fever at the same time as the troops.

The metecrological characteristics of 1872, had nothing remarkable, further than that the temperature was higher than the mean for the last 20 years, and that the rain-fall was (5 inches) likewise above the mean. The year was a stormy one in the Indian Ocean, more cyclones having occurred than in any year since 1862. Within a few years, the greater portion of the forests in the interior have disappeared, from which has resulted a manifest disturbance in the local meterology of the island. I do not think that the denuding of a tropical island of its forests affects much its rain-fall on an average of years, though I am persuaded that it causes a much more rapid drainage and evaporation of the rain water, and thereby creates greater variations in the humidity and temperature of the air. The speedy disappearance of the rain

Mauritius. water must bring about a partial, or total, dessication of the ponds and lower marshes on the low-lying grounds in times of drought, and thus prove a fertile source of malaria. Mauritius, being far distant from any large masses of land, can but count on two kinds of rain—viz., that which comes direct from the sea, brought by the trade or variable winds, and those which are formed on the land itself by the successive condensation of the vapours which it gives off. In the first, I would place the summer showers, the cause of which has no connection with the destruction of the forests, but which are always met with in a determined terrestrial zone, and coincident with certain atmospheric changes, they are also brought by the cyclones, which annually pass at a greater or less distance from us, and by other storms and rains which are but little, if at all affected (as regards their advent) by local circumstances and conditions. These rains are usually very abundant, and prevail from November to May, January being the rainiest month of the year.

The rains of the second category are those which belong to the local meteorology; they are irregular, and are partly formed on the land itself, and also from the currents of air, charged with moisture, which, passing over the hills, are condensed on what remains of our forest lands. I will not enter upon the discussion of the theory which explains these phenomena, further than to call attention to the physical principle, that hot surfaces radiate towards surrounding bodies and raise their temperature; the mountains, the slopes of which have been denuded of their wood, exposed to the action of the sun, absorb a large amount of heat, which after a time is given off; if the stratum of air charged with humidity passes near, it receives a portion of this radiated heat, dilates, and, owing to the decrease in its specific weight, rises towards the higher lands and disappears. When, on the contrary, the mountains and their slopes are covered with woods, the soil and the lower strata of air remain cool, and do not radiate with so much activity, therefore, currents of air, charged with moisture, passing over these regions, are for the most part condensed, and fall in rain. In this sense we may say that forests attract rains. It is certain that, in former years, this phenomenon was much more general, and gave to vegetation an impulse and vigour which it does not now possess. At that period, the greater portion of the rain which fell was absorbed, and for a long period retained in the soil, instead, as now, of immediately running off and inundating the lower plains, carrying with it and depositing much organic matter, to which, doubtless, is due our now endemic paludal fever.

I believe that from the labours of Mr. Meldrum, of Mauritius, and others, it will soon be established that there is a meteorological cycle of about 11 years duration, and if this be fully proved, we should expect something similar with respect to epidemic outbreaks of disease, if there is any connection between weather and the sanitary condition of a country.

Port Louis (Line Barracks).—The only sanitary works performed during the year have been re-laying the flooring of the latrines and pointing the joints with cement; all the barrack-rooms in occupation have been whitewashed.

Fort George.—A large cesspit, built in brick and lime with cement, has been constructed to receive the drainage from the cook-houses, &c., to replace the two temporary pits of dry rubble masonry formerly existing; the evil of the latter was that the drainage passed through the rubble walls and permeated the surrounding soil; a small steam pump is used to empty the cesspit when necessary. A latrine and urinal, built of masonry, and covered with corrugated iron, has been completed this year. The sanitary works, on the eastern side of the *Mor Rouge,* are still progressing; the retaining walls, constructed by convict labour, have everywhere withstood the effects of the late hurricane floods, and the plantations on the reclaimed lands behind them, as well as along the Fanfaron rivulet, are in a flourishing condition; no foul smells are now wafted over the fort as in former years.

Candan Works (in font of the Artillery Baracks).—The further dredging has made some progress, but the works supplementary of these important sanitary improvements, and forming part of the basis of a system of surface

drainage operations for that portion of the town, have not yet been begun by the General Board of Health, owing to want of the necessary funds. *Mauritius.*

Reduit.—Additional water supply for drinking purposes has been laid on, which, being conveyed through iron pipes, is less liable to pollution. Further than a few pressing repairs, nothing has been done to the barrack buildings, as recommended in my report of 28th February 1872. Since November, and owing to the temporary absence of the Governor, the post has not been occupied by troops.

Curepipe.—The ground at the future sanitarium, for the erection of the officers' and soldiers' huts, has been cleared, and three have already been erected, but not yet completed, and the foundations for the remaining two have been laid; no progress has yet been made with the officers' huts. A good spring has been found in the vicinity of the camp, and a small reservoir constructed, which was always full during the dry season. All necessary roads have been made.

Mahebourg.—The stone barracks have been re-roofed, and the rooms well scraped and lime-washed. A permanent and important sanitary work, the filling up of the large mangrove swamp, formed by the River "La Chaux," in rear of the stone barracks, by civil prison labour, will be completed in a few weeks, and it is proposed to plant the large space of ground, thus reclaimed, with trees. The parade ground has been thoroughly drained and laid with coral, and several drains or gutters have been constructed, round the wooden barracks, to carry off the rain water, which formerly soaked into the foundation walls. The fives-court is being laid with asphalt, a material with which all the surface drains ought to be constructed, as soakage of the soil would then be prevented. A spacious bathing shed, with spring board, has been erected on the right bank of the river for the use of the men. There exists, however, no bathing accommodation for the women and children.

Section II.

On the Extent of Invaliding.

Sixteen invalids were sent to England from Mauritius, and six were discharged the service at Netley, being, respectively, in the ratio of 34·12 and 12·82 per 1,000 of the mean strength, and considerably below the average of the preceding 10 years. Malarious fevers furnished nearly one-third of the invalids; constitutional affections and diseases of the digestive system each one-fourth.

Section III.

Mean Daily Sick.

The average number constantly sick during the year was 21·33, or 45·48 per 1,000 of the strength, being 3·38 above the ratio for 1871, but 3·88 below the average for the previous 10 years.

The following Table gives the usual information calculated from the above number and the mean strength :—

	1872.	1862-71.
Ratio per 1,000 of Strength constantly Sick	45·48	49·36
	Days.	Days.
Mean Sick-Time to each Soldier	16·60	18·01
Average duration of cases of Disease	11·20	16·13

Mauritius. This shows that although the admissions were much more numerous, and the proportion constantly sick was considerably higher, than in 1871, the general severity of the cases, so far as it can be judged of from the average stay of the patients in hospital, was much less. Both as to the sick time to each soldier, and as to the average duration of the cases, the results for 1872 are much below the average for the previous 10 years.

Section IV.

Influence of Age on Mortality.

In consequence of the changes of the troops quartered in the island, the information required for the completion of the table of ages and mortality was not available.

IX.—ON THE HEALTH OF THE TROOPS SERVING IN THE ISLAND OF CEYLON.

Section I.

Sickness and Mortality.

STATISTICAL REPORT.

1.—WHITE TROOPS.

Ceylon. THERE was no change in the constitution of the force stationed in Ceylon during the year, which consisted of the Head-Quarters and Nos. 6 and 7 Batteries of the 2nd Brigade Royal Artillery, the 73rd Regiment, and a few non-commissioned officers of the Ceylon Rifle Regiment, and details of the Army Hospital Corps. The average strength was 1,001; the admissions into Hospital were 1,026; and the deaths, including 3 of invalids at sea, on the voyage to England, were 25. The ratios per 1,000 of the strength represented by these numbers are for admissions 1024·9, and for deaths 24·97, the former being considerably below, but the latter more than double the corresponding ratio for the preceding year.

The following Table, framed from Abstract No. 16 in the Appendix, shows the admissions and deaths from the different classes and orders of diseases:—

Orders.	White Troops .. Diseases.	Strength, 1,001. Admitted.	Died. At Ceylon.	Died. Of Invalids.	Died. Total.	Annual Ratio per 1,000. 1872. Admitted.	1872. Died.	1869–71. Admitted.	1869–71. Died.
	I. *General Diseases.*								
1	Febrile Group ..	125	5	..	5	124·9	4·99	224·0	2·87
2	Constitutional „ ..	123	3	1	4	122·9	3·99	150·0	3·59
	II. *Local Diseases.* Diseases of the—								
1	Nervous system ..	12	1	..	1	12·0	1·00	11·1	·72
2	Eye	29	..	..	..	29·0	..	41·3	..
3	Ear	9	..	..	..	9·0	..	15·4	..
5	Circulatory system ..	12	1	..	1	12·0	1·00	16·9	2·15
6	Absorbent „ ..	57	..	..	..	56·9	..	34·4	..
8	Respiratory „ ..	34	1	..	1	33·9	1·00	46·3	·72
9	Digestive „ ..	252	10	2	12	251·7	11·99	337·8	7·53
10	Urinary „ ..	107	..	..	..	106·9	..	83·3	1·08
11	Generative „ ..	26	..	..	..	26·0	..	25·5	..
12	Organs of Locomotion	4	..	..	..	4·0	..	7·5	..
13	Cellular Tissue ..	21	..	..	..	20·9	..	35·5	..
14	Cutaneous system ..	68	..	..	..	67·9	..	138·9	·36
	III. *Conditions, &c.*								
	Debility	8	..	..	..	8·0	..	7·2	..
	IV. *Poisons* ..	22	..	..	..	22·0	..	23·3	·72
	V. *Injuries.*								
2	Accidental	115	..	..	..	114·9	..	141·4	1·08
4	Self-inflicted	1	1	..	1	1·0	1·00	..	·36
	No appreciable disease	1	..	..	..	1·0	..	2·2	..
	Total	1,026	22	3	25	1024·9	24·97	1342·0	21·18
	Average of 10 years, 1862–71	..	..	..	..	1365·3	23·15	..	..

The admissions were below the average of the previous three years by 317·1 per 1,000 of the strength, but the deaths were above it by 3·79.

General Diseases were less prevalent but more fatal than in 1871, the reduction of prevalence extending over both groups, but the increase of mortality being confined to the constitutional one. The admissions and deaths from the principal diseases of this class are shown in the following Table:—

Ceylon.

Diseases.	Admitted.	Died.	Ratio per 1,000 of Mean Strength.			
			1872.		1869-71.	
			Admitted.	Died.	Admitted.	Died.
Febrile—						
Eruptive Fevers	..	..	..	..	·7	..
Continued „	32	2	32·0	2·00	62·8	·72
Paroxysmal „	78	3	77·9	3·00	153·3	1·79
Malignant Cholera	..	..	..	..	·4	·36
Influenza	12	..	12·0	..	6·8	..
Erysipelas	1	..	1·0	..	..	..
Other diseases of this group.	2	..	2·0	..	..	..
Total	125	5	124·9	5·00	224·0	2·87
Constitutional—						
Rheumatism	28	..	28·0	..	25·8	..
Syphilis	79	1	78·9	1·00	92·2	..
Scrofula, Phthisis, &c. ..	8	2	8·0	2·00	13·6	3·23
Scurvy and Purpura ..	..	..	..	..	·4	..
Anæmia	6	..	6·0	..	15·1	..
Other diseases of this group	2	1	2·0	1·00	2·9	·36
Total	123	4	122·9	4·00	150·0	3·59

There were no admissions for *Eruptive Fevers* during the year, and those for *Continued Fevers* were less than half as numerous as in 1871. Most of the cases admitted under the latter head were of a trivial nature, and unattended with danger; but two fatal cases of enteric fever occurred among the military prisoners confined in the civil jail at Colombo, a building, from gross sanitary defects, quite unfit for the reception of Europeans, and from which it was subsequently found necessary to remove the remaining military prisoners on account of the prevalence of dysentery in a severe and fatal form among them.

Paroxysmal Fevers were much less prevalent than during the preceding year, but the reduction was chiefly in ague, the admissions for remittent fever being only 7 fewer, and the deaths from it only one fewer than in 1871. Most of the admissions for remittent fever occurred in the 73rd Regiment, and the majority of them at Trincomalee. At Colombo the admissions for fevers of all kinds fell from 111 in 1871 to 30 in 1872, the decrease being attributable, in the opinion of the Surgeon of the Regiment, to the removal of the ramparts, which previously shut out the sea breeze from the fort.

Rheumatism prevailed to about the same extent as during the preceding year, which was slightly above the average.

Syphilis was considerably less prevalent, the ratio of admissions for it (78·9 per 1,000 of the strength) being lower by 22·7 than in 1871, and 13·3 below the average of the three years from 1869 to 1871. The Principal Medical Officer reports that the "Contagious Diseases Act" is in full force, but that there are some difficulties in the way of its being efficiently carried out.

From *Phthisis* there were 8 admissions and 2 deaths, a higher proportion than in 1871, but below the average.

From *Anæmia* there were but 6 admissions, the average being 16. The reduction under this head, and that of general debility, is probably attributable to the reduced prevalence of malarious fever above noted.

Local Diseases.—There was a reduction in the ratio of admissions for diseases of the nervous and cutaneous systems, and an increase in those for diseases of the absorbent, respiratory, urinary, and generative systems. Compared with the average for the three years, from 1869 to 1871, there was a marked reduction in the prevalence of diseases of the eye and ear, and of the respiratory, digestive, and cutaneous systems and the cellular tissue, and an increase in urinary affections, and diseases of the absorbent system. The admissions for gonorrhœa and its sequelæ were in the ratio of 96·90 per 1,000 of the strength.

Ceylon.

The mortality from diseases of the digestive system was much above that in 1871, and much above the average. Of the 10 deaths recorded from that order 5 were returned under dysentery, and 5 under hepatitis, but in nearly all the fatal cases dysentery seems to have been the primary disease. For dysentery and diarrhœa together the admissions were 149, or in the ratio of 148·85 per 1,000 of the strength. For hepatitis they were 40, or in that of 39·96 per 1,000 of the strength. The ratio of mortality from each was 4·99 per 1,000 of the strength. The increased prevalence and fatality of dysentery is attributed in part to the unusually heavy rainfall during the year, and the inundation of many parts of the island, but chiefly to the insanitary condition of the civil jail at Colombo already referred to, in which many of the worst cases originated.

ACCIDENTS were considerably below the average, and none of them were fatal. There was one case of *suicide* by rifle shot in the 73rd Regiment, at Colombo, the indirect result of intemperance.

2.—ASIATIC TROOPS.

The Asiatic troops employed in Ceylon during the year consisted of the Ceylon Rifle Regiment, 775 strong, and 87 Gun Lascars, and the stations occupied by them were Colombo, Kandy, Trincomalee, and Galle. The average strength of the whole was 862; the admissions into hospital were 511; and the deaths were 9. These numbers represent ratios of 592·8, and 10·44, per 1,000 of the strength, the former considerably below, but the latter 2·19 above the corresponding ratio for the preceding year. Both are much below the average for the previous ten years.

The following Table, framed from Abstract No. 16 in the Appendix, shows the admissions and deaths from the different classes and orders of diseases:—

Orders.	Asiatic Troops ..	Strength 862.		Annual Ratio per 1,000 of Mean Strength.			
	Diseases.	Admitted	Died.	1872.		1869–71.	
				Admitted	Died.	Admitted.	Died.
	I. *General Diseases.*						
1	Febrile Group ..	155	1	179·8	1·16	191·1	1·52
2	Constitutional „ ..	33	4	38·2	4·64	61·8	1·89
	II. *Local Diseases.* Diseases of the—						
1	Nervous System ..	1	1	1·2	1·16	4·2	1·14
2	Eye	65	..	75·4	..	44·3	..
3	Ear	3	..	3·5	..	·4	..
5	Circulatory System ..	1	..	1·2	..	2·6	·38
6	Absorbent „ ..	7	..	8·1	..	8·3	..
8	Respiratory „ ..	21	..	24·4	..	50·8	3·03
9	Digestive „ ..	38	3	44·1	3·48	48·5	1·14
10	Urinary „ ..	7	..	8·1	..	25·4	..
11	Generative „ ..	6	..	6·9	..	15·1	..
12	Organs of Locomotion	1	..	1·2	..	1·5	..
13	Cellular Tissue ..	14	..	16·2	..	22·4	..
14	Cutaneous System ..	88	..	102·1	..	104·5	·38
	III. *Conditions, &c.*						
	Debility	3	..	3·5	..	4·2	..
	IV. *Poisons.*	1	..	1·2	..	·4	..
	V. *Injuries.*						
2	Accidental	67	..	77·7	..	47·0	..
	Total	511	9	592·8	10·44	632·5	9·48
	Average of 10 years, 1862–71 ..	..	..	901·6	15·10	..	..

Ceylon.

The ratio of admissions for GENERAL DISEASES was lower than in 1871, and much below the average, the reduction extending over both groups. From the Febrile group the mortality was almost the same as in 1871, but from the Constitutional group it was much higher, and more than double the average for the three years from 1869 to 1871.

The admissions and deaths from the principal diseases of this class were as follows:—

General Diseases.	Admitted	Died.	Ratio per 1,000 of Mean Strength.			
			1872.		1869–71.	
			Admitted	Died.	Admitted	Died.
Febrile—						
Eruptive Fevers..	11	..	12·8	..	8·0	..
Continued „	..	..	..	..	1·1	..
Paroxysmal „	144	1	167·0	1·16	179·7	·76
Malignant Cholera	..	..	..	..	..	·38
Erysipelas	..	..	..	..	·8	·38
Other diseases	..	..	..	..	1·5	..
Total	155	1	179·8	1·16	191·1	1·52
Constitutional—						
Rheumatism	19	..	22·0	..	30·7	·38
Syphilis	7	1	8·1	1·16	14·0	..
Scrofula, Phthisis, &c.	7	3	8·1	3·48	2·3	1·52
Anæmia	..	..	..	..	2·3	..
Other diseases	1	..	1·2	..	12·5	..
Total	34	4	39·4	4·64	61·8	1·90

Eruptive Fevers were rather more prevalent than in 1871, the admissions for them having been 5 for small-pox, 5 for chicken-pox, and 1 for vaccination, all in the Ceylon Rifles. All the cases of small-pox were modified by the effects of previous vaccination.

There were no admissions for *continued fever* during the year. Those for *paroxysmal fevers* were less numerous than in 1871, and considerably below the average. With the exception of three cases of remittent fever, one of which proved fatal, all the admissions under this head were for ague.

Rheumatism was rather more prevalent than during the preceding year, but below the average.

Syphilis caused only 7 admissions, which represent a ratio of 8·1 per 1,000 of the strength, but one death resulted from that disease.

Phthisis caused an equal number of admissions, but 3 deaths, all the latter in the Ceylon Rifles at Colombo.

There were no admissions for beri-beri during the year.

LOCAL DISEASES.—There was an increase in the prevalence of diseases of *the eye*, which were much above the average in the Ceylon Rifles, but all the admissions were for "conjunctivitis," and the attacks do not seem to have been of a very serious description. Diseases of the *respiratory* system were much below the average as to prevalence, and no mortality resulted from them. Those of the *digestive* system also were less prevalent than during the preceding year, and rather below the average, but the mortality from them was greater than usual. Affections of the *urinary* and *generative* systems were greatly below the average, the admissions for gonorrhœa and its sequelæ having been in the ratio of only 8·12 per 1,000 of the strength.

SANITARY REPORT.

Deputy Inspector-General Watt reports:— *Ceylon.*

The year 1872 has been, on the whole, a healthy one, and bears a favourable comparison with 1871.

Dysentery has, however, been more intractable in its form, and double the number of admissions have taken place from it than in the year preceding. This is probably due, in some measure, to climatic influences. After a long, dry and hot period at the early part of the year, great quantities of rain fell, and the country, especially about Colombo—where the greatest amount of this disease occurred—was inundated, and remained so for a long time. But another marked cause of increase, in the number of admissions from this affection, was the insanitary state of the convict prison at Welikada, where dysentery, towards the latter part of the year, prevailed as an epidemic, and great mortality occurred. As many cases had been sent to the regimental hospitals, some of them very severe, I considered it necessary to recommend the removal of the military prisoners. This was done, and no cases of disease of any importance have been admitted since the prisoners have been in the Garrison Cells, where they still remain. I would strongly recommend that a military prison should be built at Colombo, for the reception of prisoners from all the stations in the island. The Garrison Cells, now in use, will soon have to be given up, and others built, and it would not add greatly to the expense, if a sufficient number were built to accommodate all the military prisoners, as men are now only sent to the Garrison Cells when their sentences do not exceed 42 days' imprisonment.

Many additional buildings have been finished and occupied in the course of the year, especially two magnificent blocks of buildings at Colombo, a full description of which was given in last year's report. At Galle and Trincomalee also, new barracks have been built, and the means of ablution, ventilation, and drainage have been improved. Benham's ranges have also been supplied, for the use of the European troops, at nearly all the stations in the island, and the dry-earth system is extended to all stations. I append to this a detailed report of the buildings and improvements which have been finished and commenced during the year 1872.

No alterations have taken place in the rations of the troops, which I consider are of good quality and sufficiently varied, nor has there been any change in the clothing of the troops, which appears suited to the climate. The thin flannel shirts which have been issued for the use of the sick in hospital, have proved a great comfort, as the thick ones which were formerly issued were unfitted for use in tropical hospitals. I trust that very soon all the hospitals in the island will be supplied with them.

The water supply throughout the island is generally good and abundant; at the new hospital on Galle Face, and the new married quarters adjacent, however, it has been found on analysis to be perfectly unfit for use, containing a large amount of animal impurities, which seem to arise from soakage from the lake, which is close by, and into which sewage of all descriptions is put. The water in the new barracks is of excellent quality, and a supply is daily sent down for the use of the quarters and hospital, for the purposes of drinking and cooking. I believe it is in contemplation to lay down pipes to convey pure water from the barracks to the whole of the quarters and hospital.

The water also at some of the wells at Trincomalee has been found unfit for use, but there is an ample supply obtainable from those which contain good water. At all stations filters are used.

Ceylon.

Station.	Name of Building or alteration.	General description.
Colombo ..	New hospital, Galle Face.	Completed.
	Married soldiers' quarters, do.	Completed.
	Quarters for four married officers.	Completed.
	Quarters for eight Staff-Serjeants, facing the sea.	To be completed in 1873. These are one-storied buildings, with verandah back and front, and containing 8 quarters of 2 rooms each, with a separate cook-house, bath-room, and w.-c. The floor is to be of wood, and well raised off the ground, and ventilated underneath. The water is to be laid on from the tank at soldiers' barracks.
	Water supply ..	The water is obtained from 2 large wells behind the barracks, and is pumped into an iron tank, capable of holding 10,000 gallons, by one of Hayward, Tylers & Co.'s patent self-acting steam pumps. The water is conducted by a 3-in. main on to the cook-houses, ablution-rooms, bath-rooms, and day and night urinals of the soldiers' barracks, also to cook-houses, bath-rooms, and Staff-Serjeants' quarters. To be completed in 1873.
	Conversion of old hospital.	The old hospital has been converted into Serjeant-Major's quarters (R.A.), Serjeants' mess (Infantry), Mess-Serjeant's quarter, canteen and Canteen-Serjeant's quarter, Quartermaster's stores and office, Shoemaker's shop, and recreation rooms for Artillery and Infantry. The old Purveyor's store has been converted into Tailors' shop and Master Tailor's quarters. Completed.
	First two blocks of new soldiers' barracks.	Completed.
	Second two blocks of new soldiers' barracks.	In progress.
	Outbuildings to soldiers' barracks.	Completed for 3 blocks of barracks. The outbuildings contain cook-houses, latrines on the dry-earth system, cement-urinals with water running constantly through them, and baths (cement) with water laid on. The cook-houses are fitted with Benham's patent cooking ranges, adapted for burning wood.
Kandy ..	New wards to garrison hospital.	Completed.
	Ceylon rifle barracks.	Various improvements to both married and single men's quarters.
Galle	Nos. 1 & 2, Old European barracks.	Completed.
	Upper story to No. 4 barracks.	Completed.
Trincomalee.	Nos. 2 & 3, European barracks.	Completed.
	Recreation room, for European troops.	To be completed in 1873.
	Native barracks and hospital.	Drainage completed. Moveable latrines on the dry-earth system completed for single men.
NeweraEliya	New hut barracks and hospital.	In progress.

Section II.

On the Extent of Invaliding.

Ceylon.

Of the European troops in this Command, 5 only, or 5·00 per 1,000 of mean strength, were sent to England, as against 61, or 62·6, invalided in 1871; 15, or 14·99 per 1,000, were, however, discharged the service at Netley, the majority of these being invalids of the previous year. Of the Asiatic troops, 7 only, or 8·12 per 1,000, were discharged the service; the number discharged in 1871 being 51, or 60·1. The very high rate of invaliding in the previous year was probably the cause of this very marked reduction.

	European Troops.		Asiatic Troops.
	Invalids sent to England.	Invalids Discharged at Netley.	Discharged as Invalids in Ceylon.
Strength	1,001.	1,001.	862.
I. *General Diseases.*			
Constitutional Group	1	3	..
II. *Local Diseases.*			
Diseases of the—			
Nervous System	..	1	..
Eye	..	1	..
Circulatory System	..	4	..
Digestive „	3	3	..
Urinary „	1	1	
III. *Debility*	..	1	7
V. *Injuries.*			
Accidental	..	1	..
Total	5	15	7
Ratio per 1,000 of Mean Strength .. .. { 1872 ..	5·00	14·99	8·12
{ 1862-71	53·46	25·50	22·87

Diseases of the digestive system were the chief cause of invaliding in the white troops. The seven men of the Asiatic troops were all discharged under the head of debility.

Section III.

Mean Daily Sick.

The average number constantly sick in Ceylon during the year was 51·11 of the White troops, and 21·13 of the Black, or 51·06, and 24·51 per 1,000 of the strength.

The usual information, calculated from these numbers, is given in the following Table:—

	European Troops.		Asiatic Troops.	
	1872.	1862-71.	1872.	1862-71.
Ratio per 1,000 of Strength constantly sick	51·06	63·53	24·51	33·48
	days.	days.	days.	days.
Average sick time to each Soldier	18·69	23·19	8·97	12·22
Average duration of cases of Sickness ..	18·23	16·98	15·13	13·55

Ceylon.

The proportion constantly sick was considerably lower than in 1871 among the European troops, and much lower among the Asiatic troops. The average sick time to each soldier also, was reduced in both classes. The average duration of the cases was slightly increased among the European troops, but considerably reduced among the Asiatic troops.

Section IV.

The Influence of Age on Mortality.

The following Table shows the ages of the European and Asiatic troops, and the deaths at each age in quinquennial periods:—

Corps.	Under 20 Years.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.	
	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.
WHITE TROOPS.												
2nd Brigade, Royal Artillery ...	2	...	46	1	96	2	36	1	9	2	...	...
73rd Foot...	71	...	495	8	177	5	64	2	10	...	...	2
Total	73	...	541	9	273	7	100	3	19	2	...	3
Ratio per 1,000 of strength { 1872	...		16·63		25·64		30·00		105·26		...	
1862-71 ...	5·17		17·50		28·50		29·35		65·02		...	
BLACK TROOPS	87	1	239	3	183	2	123	2	109	1	46	...
Ratio per 1,000 of strength { 1872	11·49		12·55		10·93		16·26		9·17		...	
1862-71 ...	9·98		19·04		23·06		18·85		17·13		12·80	

The above Table shows a gradually increasing ratio of mortality among the white troops in this Command up to 35 years, and an excessive death rate between 35 and 40.

X.—ON THE HEALTH OF THE TROOPS SERVING IN CHINA AND THE STRAITS SETTLEMENTS.

Section I.

Sickness and Mortality.

I.—CHINA.

STATISTICAL REPORT.

1. EUROPEAN TROOPS.

China.

NUMBER 8 Battery, 2nd Brigade, Royal Artillery, embarked for England on the 6th April, having been relieved by No. 3 Battery of the same brigade, which arrived from Singapore on the 28th March. The head-quarters and right wing of the 1st Battalion 10th Regiment remained at Hong Kong at the termination of the preceding year, and on the 28th March 1872 they were joined by the left wing from Singapore. On the 18th November the right

wing embarked for Singapore, and on the 13th December it was followed by the head-quarters and the left wing, the head-quarters of the 80th Regiment having arrived from Singapore on the 9th of that month. The garrison also included 21 men of the Royal Engineers, and a few details of the Army Hospital Corps, and the Garrison Staff. Its average strength was 769, the admissions into hospital were 1,463, and the deaths, including one of an invalid at sea on the voyage home, were 15. The ratios per 1,000 of the strength represented by these numbers are, for admissions 1902·4, and for deaths 19·50, both much in excess of the ratios for the preceding year, but below the average for the previous 10 years. *China.*

The following Table, framed from Abstract No. 18 in the Appendix, shows the admissions and deaths from the different classes and orders of diseases :—

Order.	Diseases.	Strength .. .. 769. Admitted.	Died. In China.	Died. Of Invalids.	Died. Total.	Ratio per 1,000 of Mean Strength. 1872. Admitted.	1872. Died.	1869–71. Admitted.	1869–71. Died.
	I. *General Diseases.*								
1	Febrile Group ..	621	2	..	2	807·6	2·60	590·6	·61
2	Constitutional Group	100	1	..	1	130·0	1·30	109·2	3·66
	II. *Local Diseases.* Diseases of the—								
1	Nervous System ..	7	3	..	3	9·1	3·90	16·5	1·22
2	Eye	20	..	..	..	26·0	..	31·7	..
3	Ear	10	..	..	..	13·0	..	11·6	..
4	Nose	..	..	..	..	..	..	2·5	..
5	Circulatory System ..	22	1	..	1	28·6	1·30	12·8	2·44
6	Absorbent „ ..	5	..	..	..	6·5	..	4·3	..
8	Respiratory „ ..	39	1	..	1	50·7	1·30	34·8	1·22
9	Digestive „ ..	226	2	1	3	293·9	3·90	291·0	·61
10	Urinary „ ..	117	1	..	1	152·2	1·30	103·1	..
11	Generative „ ..	22	..	..	..	28·6	..	29·9	..
12	Organs of Locomotion	7	..	..	..	9·1	..	2·5	..
13	Cellular Tissue ..	34	..	..	..	44·2	..	20·7	..
14	Cutaneous System ..	85	..	..	..	110·5	..	86·6	..
	III. *Conditions, &c.* Debility	31	..	..	..	40·3	..	9·1	·61
	IV. *Poisons* ..	17	1	..	1	22·1	1·30	18·3	1·83
	V. *Injuries.*								
2	Accidental	94	..	..	..	122·2	..	106·8	·61
3	Homicidal	1	2	..	2	1·3	2·60	..	..
	VI. *Surgical Operations*	..	..	..	..	..	..	1·8	..
	No appreciable Disease	5	..	..	..	6·5	..	4·3	..
	Total..	1,463	14	1	15	1902·4	19·50	1488·1	12·81
	Average of 10 years, 1862–71	..	..	..	..	1932·1	63·08	..	..

GENERAL DISEASES were nearly twice as prevalent as in 1871, the increase extending over both groups, but being greatly most marked in the febrile one. The mortality from them was slightly below the average.

The following Table shows the admissions and deaths from the principal diseases of this class :—

China.

General Diseases.	Admitted.	Died.	Ratio per 1,000 of Mean Strength. 1872. Admitted.	1872. Died.	1869–71. Admitted.	1869–71. Died.
Febrile—						
Eruptive Fevers	..	..	..	..	·6	..
Continued „	224	2	291·3	2·60	42·1	..
Paroxysmal „	395	..	513·6	..	539·4	·61
Influenza	2	..	2·6	..	5·5	..
Erysipelas	..	..	..	..	2·4	..
Other diseases of this group	..	..	..	..	·6	..
Total	621	2	807·5	2·60	590·6	·61
Constitutional—						
Rheumatism	38	..	49·4	..	21·4	..
Syphilis	53	..	68·9	..	72·6	..
Scrofula, Phthisis, &c.	2	..	2·6	..	13·4	3·66
Scurvy and Purpura	..	..	..	..	·6	..
Anæmia	4	..	5·2	..	1·2	..
Other diseases of this group	3	1	3·9	1·30	..	..
Total	100	1	130·0	1·30	109·2	3·66

There were no admissions for *eruptive fevers*, but those for *continued fevers* were much above the average. Of 224 admissions, however, 204 were for *febricula*, and of these cases the Principal Medical Officer states that the majority were of malarious origin, and should have been returned as ague. Four cases of *enteric fever* were admitted, 2 in the Royal Artillery, and 2 in the 10th Regiment, and one in each corps proved fatal. The disease was well marked, and in the fatal cases the characteristic lesions of the intestine were found on *post-mortem* examination. At the time no sanitary defects sufficient to account for the origin of these cases could be discovered, but the Principal Medical Officer states that it was subsequently ascertained that the men had been occasionally using for drinking the water from a pump in the Artillery Square, which was supposed to be used only for ablution, and which had become contaminated by fœcal matter through the stoppage of a drain, and the abominable system which the coolies attached to the latrines had been permitted to establish, of washing the pans at the pump, and emptying the water so used over the surrounding surface.

Paroxysmal fevers were much more prevalent than during the preceding year, but rather below the average of the three years from 1869 to 1871. The great majority of the admissions under this head were for ague, and a much higher proportion of them occurred in the 1st Battalion 10th Regiment, than in the Artillery. The Surgeon of the former regiment reports that they occurred chiefly in the wing which arrived from Singapore on the 28th March, and he attributes many of the attacks to the much greater coldness of the climate of Hong Kong at that season. The change of climate, however, did not affect the men of the battery of Artillery which arrived at the same time, to anything like the same extent; and it appears that the men of the 10th Regiment who were quartered in the Victoria Barracks suffered to a much greater extent than those who were quartered in the Murray and Wellington Barracks. Many of the men were much prostrated and debilitated by repeated attacks of malarious fever, but there was no death from it during the year.

Rheumatism was nearly three times as prevalent as during the preceding

year, the increase being probably due to the change of climate above mentioned; but there was a reduction of 22·2 per 1,000 of the strength in the ratio of admissions for *syphilis*, which was also considerably below the average. The Principal Medical Officer reports that the Contagious Diseases Act is strictly carried out by the civil authorities. From *phthisis* there were but two admissions and no deaths.

Local Diseases.—Diseases of the *nervous system* were below the average as to prevalence; but three deaths were caused by them. Those of the *eye* were nearly twice as prevalent as during the preceding year, but much below the average, and with the exception of two of cataract and one of ulcer of the cornea all the cases admitted were of a trivial nature. Diseases of the *circulatory* and *respiratory systems* were much above the average, and the former were five times and the latter more than twice as prevalent as in 1871. Nearly all the admissions from both orders occurred in the Infantry Regiment. Diseases of the *digestive system*, as in former years, occasioned more admissions than any other order except the febrile group of general diseases, but their prevalence was little above the average. There were two deaths from abscess of the liver, and one from cirrhosis of that organ, the latter at sea, on the voyage home. *Urinary affections* were above the average and considerably more prevalent than during the preceding year. The excess occurred in gonorrhœa and its sequelæ, from which the admissions were in the ratio of 143·04 per 1,000 of the strength.

Conditions, &c.—The admissions for debility were more than four times the average. Most occurred in the 1st Battalion 10th Regiment, and they are attributed by the Surgeon to the prevalence of malarious disease.

Poisons.—There were 16 admissions for delirium tremens and one for alcoholic poisoning, which represent a ratio of 22·1 per 1,000 of the strength. This high ratio was due, however, to the repeated admissions of a comparatively small number of men.

Accidental injuries were more numerous than in 1871, and above the average, but none of them were fatal.

Two cases of *homicide* occurred in the 1st Battalion 10th Regiment. One man while on guard was shot by a sentry of his own regiment, and another was killed by a blow received in a fight. There were no deaths by *suicide* and no admissions for self-inflicted injuries.

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2. Native or Asiatic Troops.

The Asiatic troops stationed at Hong Kong during the year consisted of the Gun Lascars, of whom the average strength was 69·5, and for the first four months the 13th Madras Native Infantry, of which the average strength during that period was 853. In the beginning of May, that regiment returned to India. The average strength of the force during the year was 354; the admissions into hospital were 278; and the deaths were 6. The ratios per 1,000 of the strength represented by these numbers are, for admissions 785·3, and for deaths 16·94, the former being not much more than half, but the latter more than double, the corresponding ratio for 1871. Both are much below the average for the preceding ten years.

The following Table, framed from Abstract No. 18 in the Appendix, shows the admissions and deaths from the different classes and orders of diseases:—

China.

Orders.	Native Troops. Diseases.	Average Strength, 354. Admitted.	Deaths.	Ratio per 1,000 of Mean Strength. 1872. Admitted.	Died.	1869–71. Admitted.	Died.
	I. *General Diseases.*						
1	Febrile Group	84	..	237·3	..	491·6	2·62
2	Constitutional Group ..	22	1	62·1	2·82	52·7	2·24
	II. *Local Diseases.* Diseases of the—						
1	Nervous System	1	..	2·8	..	10·5	2·24
2	Eye	..	..	..	..	6·4	..
3	Ear..	1	..	2·8	..	·7	..
4	Nose	..	..	..	..	·4	..
5	Circulatory System ..	2	3	5·7	8·47	1·9	1·49
6	Absorbent „ ..	2	..	5·7	..	..	..
8	Respiratory „ ..	24	..	67·8	..	45·6	1·87
9	Digestive „ ..	26	2	73·4	5·65	224·1	7·47
10	Urinary „ ..	28	..	79·1	..	13·4	..
11	Generative „ ..	3	..	8·5	..	5·6	..
12	Organs of Locomotion ..	..	..	..	..	3·4	..
13	Cellular Tissue	9	..	25·4	..	27·6	..
14	Cutaneous System ..	41	..	115·8	..	124·0	..
	III. *Conditions, &c.*						
	Debility	7	..	19·8	..	16·8	..
	IV. *Poisons.* ..	..	..	..	..	2·2	·37
	V. *Injuries.*						
2	Accidental..	28	..	79·1	..	38·1	..
	VI. *Surgical Operations* ..	..	..	..	..	·7	..
	No appreciable disease ..	..	..	..	..	·4	..
	Total	278	6	785·3	16·94	1066·1	18·30
	Average of 10 years, 1862–71	..	..	1201·0	23·94	..	..

General Diseases.—The admissions for diseases of the febrile group were much less numerous than in 1871, and less than half the average for the previous three years, but in those for diseases of the constitutional group there was a slight increase.

The following Table shows the admissions and deaths from the principal diseases of this class:—

Asiatic Troops. General Diseases.	Admitted.	Died.	Annual Ratio per 1,000 of Strength. 1872. Admitted.	1872. Died.	1869-71. Admitted.	1869-71. Died.
Febrile—						
Eruptive Fevers	25	..	70·6	..	11·2	..
Continued „	4	..	11·3	..	1·5	·37
Paroxysmal „	55	..	155·4	..	478·9	2·24
Total	84	..	237·3	..	491·6	2·61
Constitutional—						
Rheumatism	8	..	22·6	..	36·2	·37
Syphilis	11	..	31·1	..	6·7	..
Scrofula, Phthisis, &c...	2	..	5·6	..	3·0	1·12
Anæmia	..	..	..	..	1·1	..
Other Diseases..	1	1	2·8	2·82	5·6	·75
Total	22	1	62·1	2·82	52·6	2·24

Eruptive Fevers, in a considerably reduced strength, caused the same number of admissions as during the preceding year. An outbreak of small-pox took place in the 13th Madras Native Infantry in March, when 25 cases were admitted into hospital, all, however, modified by previous vaccination, and the first five so slight that they were erroneously returned under chicken-pox. On the recommendation of the Senior Medical Officer the regiment was sent to Kowloon, and placed under canvas, the sick being isolated by being sent to the gaol on Stonecutter's Island, which was given up temporarily as a hospital. While in camp the whole of the men were re-vaccinated The disease did not spread farther, and there were no deaths from it

Paroxysmal fevers were less prevalent by more than a half than during the preceding year, and greatly below the average. All the cases admitted are stated to have been slight.

Rheumatism was much below the average, but *syphilis* was considerably above it. No cause is assigned for the increase of the latter.

Local Diseases.—There were three deaths from diseases of the *circulatory system* and two from diseases of the *digestive system*, but none from any other order of this class ; and the ratio of admissions from all, except diseases of the *respiratory* and *urinary systems*, was much reduced. That for diseases of the *digestive system* scarcely exceeded the fourth part, and that for skin diseases was less than the half of the corresponding ratio for 1871. There was but one admission for dysentery against 59 during the preceding year, and these for ulcers, boils, and itch were much less numerous. The increase in urinary diseases was confined to gonorrhœa and its sequelæ.

Injuries.—Accidental injuries were more numerous than during the preceding year by 26·7 per 1,000 of the strength, but the majority of them were of a trifling nature, and none of them proved fatal. There were no deaths by suicide and no admissions for self-inflicted injuries.

SANITARY REPORT

Deputy Inspector-General Crocker reports that the climate of the year has closely resembled that of 1871, and though the admissions into hospital and the mortality are both in excess of 1871, the year cannot be considered to have been an unhealthy one.

The existing barracks do not afford sufficient accommodation for the whole strength of the garrison, including women and children, and allowing the regulation cubic space of 1,000 feet per man. They have therefore to be

China. supplemented by hired buildings; two are at present so engaged—viz., Fletcher's buildings, which have been partially occupied throughout the year by the Gun Lascar Company, and latterly also by some of the white troops, and M'Grigor's buildings, formerly used as a barrack, and now taken up again temporarily for the same purpose, whilst the extensive repairs in C block, Murray Barracks, are being carried out. Both these buildings are mere godowns for storing merchandize; the rooms, however, are large, have plenty of cross-ventilation, and, on the whole, afford very fair accommodation. The out-buildings, such as the latrines, cook-houses, and ablution-room, are temporary constructions, and not so convenient as in regular barracks. If it be intended to keep up the garrison at its present strength, the question of increasing the permanent barrack accommodation would appear deserving of serious consideration, instead of having the men scattered about the town in hired buildings, for which a very high rental has to be paid. The sanitary condition of all the occupied buildings has been satisfactory, and no defect of any importance has been brought under notice.

The lighting of the barrack-rooms, however, is represented to be still very unsatisfactory; a lamp with two small wicks, and a ration of 2 ozs. of colza oil per day for eight men, is the allowance granted by Government. Barracks occupied by the Royal Artillery, hanging lamps (one to each room) are supplied from the canteen fund.

Intermittent fevers have been extremely prevalent. Although there are no swamps on the island, the soil of Hong Kong favours the generation of the malarious poison which is productive of intermittent fever, as it is composed of disintegrated granite, and is very retentive of moisture. Nearly all the cases of intermittent occurred in the 10th Regt., and the detachment of that corps, which arrived from Singapore just as the rainy season commenced, suffered greatly from the disease. Surgeon-Major Acton observes, that previously to the arrival of the detachment in April, there had been very little sickness, but from that date "malarial diseases, such as ague and its allied forms of fevers, became "more prevalent," and "that it was at first confined to those lately arrived." He also states "that the cold season was not quite over when they arrived, and "that all of them—men, women, and children—felt the cold, and those who "had been affected with ague fits at Singapore, had malarial fever in severer "form immediately on coming here, more especially the women and children, "and those who went on guard and were exposed to the night air." It is worthy of remark how large a proportion of the cases came from the upper block of the Victoria Barracks, which have been the last built, and are nearest to the mountain which rises abruptly behind. In the upper block not a single family escaped, and several children died from diarrhœa and debility consequent thereon. The same thing was observed in the east block, married quarters, which was formerly the native hospital, but has been converted into very convenient quarters for married people by brick partitions, and the walls were not thoroughly dry. Here also every family suffered. This is entirely in accordance with what is the common observation of the medical practitioners in the colony, that newly-built houses are for a long time unhealthy. At a later period of the year both these buildings were for a time vacated, on my recommendation, as so many of the inhabitants were suffering from enlarged spleens, and a general debilitated state of health, the result of repeated attacks of ague. But although this disease was such a fertile source of sickness, it did not cause a single death amongst the men.

Enteric Fever—Two deaths occurred from enteric or typhoid fever, of which four cases were treated. The first instance of this disease appeared in an Artilleryman from the North Barracks, and endeavours were made to trace out its origin, but at the time without any satisfactory result. The water, from a well in the barracks which was occasionally used for drinking, was suspected, and carefully examined, but was found to contain hardly a trace of organic matter, though it held in solution a large quantity of chloride, owing, I presume, to its proximity to the sea. As a precautionary measure, however, the pump was locked up. A few weeks afterwards, when some alterations were being effected in the barrack yard, the drain for carrying off the waste water from the pump was laid open, and found to be completely choked up throughout its whole extent; the night-coolies, moreover, after emptying the soil-

pans, were frequently in the habit of washing them out at the pump, and throwing the refuse water on the ground. This, therefore, had soaked into the well and vitiated the supply, and hence, no doubt, the cause of the typhoid fever. *China.*

II.—Straits Settlements.

Statistical Report.

1. White Troops.

Straits Settlements.

The troops employed in the Straits Settlements at the commencement of the year were the 3rd and 9th Batteries of the 2nd Brigade R.A., and the left wing of the 1st Battalion, 10th Foot. On the 20th March the first-mentioned battery and the wing of the 10th Regiment embarked for Hong Kong, the 80th Regiment having arrived from Ireland on the 16th of that month. In the end of the year the 80th was again relieved by the 1st Battalion of the 10th from Hong Kong. The stations and barracks occupied during the year were at Singapore, "Fort Canning," and "Tanglin," during the whole period; at Penang, "Fort Cornwallis," during the whole period, and "The Lines" from 20th April to 31st December; and at Malacca, "The Lines," from 13th May to 31st December.

The average strength during the year was 708; the admissions into hospital were 1,611; and the deaths, including one of an invalid at Netley, were 20. The ratios per 1,000 of the strength represented by these numbers are, for admissions 2275·4, and for deaths 28·25, the former being 686·9 and the latter 10·70 in excess of the corresponding ratio for 1871. Both are much above the average.

The following Table, framed from Abstract No. 18 in the Appendix, shows the proportion of the sickness and mortality which occurred from each class and order of diseases:—

Straits Settlements.

Orders.	Diseases.	Mean Strength, 708. Admissions.	Deaths. In Straits Settlements.	Deaths. Of Invalids.	Deaths. Total.	Annual Ratio per 1,000 of Strength. 1872. Admitted.	1872. Died.	1869-71. Admitted.	1869-71. Died.
	I. *General Diseases.*								
1	Febrile Group..	813	7	..	7	1148·3	9·88	348·8	·60
2	Constitutional „ ..	110	..	..	..	155·4	..	141·4	4·15
	II. *Local Diseases.* Diseases of the—								
1	Nervous System ..	23	2	..	2	32·5	2·83	17·2	·60
2	Eye	15	..	..	..	21·2	..	12·5	..
3	Ear	16	..	..	..	22·6	..	16·6	..
5	Circulatory System..	11	1	1	2	15·5	2·83	24·9	·60
6	Absorbent „ ..	17	..	..	..	24·0	..	19·0	..
8	Respiratory „ ..	41	1	..	1	57·9	1·41	48·7	·60
9	Digestive „ ..	177	5	..	5	250·0	7·06	305·4	1·78
10	Urinary „ ..	77	..	..	..	108·8	..	103·4	..
11	Generative „ ..	10	..	..	..	14·1	..	24·4	..
12	Organs of Locomotion	5	..	..	..	7·1	..	3·6	·60
13	Cellular Tissue ..	41	..	..	..	57·9	..	27·9	..
14	Cutaneous System ..	156	..	..	..	220·3	..	113·5	..
	III. *Debility.* ..	4	..	..	..	5·7	..	1·8	..
	IV. *Poisons.* ..	10	1	..	1	14·1	1·41	13·1	1·18
	V. *Injuries.*								
2	Accidental	82	2	..	2	115·8	2·83	135·4	..
4	Self-inflicted ..	..	..	..	..	..	..	·6	·60
	VI. *Surgical Operations*	..	..	..	..	..	..	·6	..
	No appreciable disease ..	3	..	..	..	4·2	..	1·2	..
	Total	1,611	19	1	20	2275·4	28·25	1360·0	10·71
	Average of four years 1868-71	..	..	..	..	1380·4	11·79	..	..

GENERAL DISEASES.—There was a great increase in the prevalence of diseases of the febrile group, the ratio of admissions for them being almost exactly twice that for the preceding year, and more than three times the average for the three years from 1869 to 1871. From diseases of the constitutional group the admissions were in a lower ratio than in 1871, but still rather above the average.

The admissions and deaths from the principal diseases of this class are shown in the following Table :—

General Diseases.	Admitted.	Died.	Ratio per 1,000. 1872. Admitted.	Died.
Febrile—				
Eruptive Fevers	1	..	1·4	..
Continued „	134	6	189·3	8·47
Paroxysmal „	674	1	952·0	1·41
Influenza	3	..	4·2	..
Erysipelas	1	..	1·4	..
Total	813	7	1148·3	9·88
Constitutional—				
Rheumatism	24	..	33·9	..
Syphilis	67	..	94·6	..
Scrofula, Phthisis, &c.	11	..	15·5	..
Scurvy and Purpura	1	..	1·4	..
Anæmia	3	..	4·2	..
Other Diseases	4	..	5·7	..
Total	110	..	155·3	..

The only case of *eruptive fever* admitted during the year was one of small-pox in the detachment of the 80th Regiment at Malacca, in September. The disease was not prevalent among the native population at the time, and it did not spread further among the troops.

Continued fevers were much above the average, both as to prevalence and as to mortality, in the detachment of the 80th Regiment at Penang, where the admissions for them were in the ratio of 486, and the deaths in that of 62 per 1,000 of the strength. Their prevalence and fatality are attributed by the Medical Officer in charge to the unsuitable nature of the accommodation provided for the men, which consisted of the old Sepoy Lines hastily adapted for their new purpose, and deficient in many sanitary requirements, and to the youth and short foreign service of the men, and their ignorance of the precautions necessary for the preservation of their health in a tropical climate. At the other stations there was no undue prevalence of these diseases, and no mortality from them. One case of *enteric fever* in the 1st Battalion 10th Regiment, shown as admitted at Singapore, originated at Hong Kong, and arrived at the former station in the stage of convalescence.

Paroxysmal fevers were greatly above the average as to prevalence, but only one death resulted from them. Of 674 admissions 660 were for ague. *Rheumatism* was not above the average, and *syphilis* was considerably less prevalent than during the preceding year, the admissions for it having been in the ratio of 94·6 per 1,000 of the strength, which is 14·4 below the ratio for 1871. From *phthisis* there were 10 admissions but no deaths.

Local Diseases.—Diseases of the *nervous system* were four times as prevalent as in 1871, epilepsy and neuralgia being the particular affections in which the increase chiefly took place, and they were greatly in excess of the average of former years. Diseases of the *eye* and the *ear* also were above the average. Those of the *circulatory system* were below it as to prevalence, but productive of a higher ratio of mortality than usual. Affections of the *respiratory system* were rather more prevalent than in 1871, and above the average; but, with the exception of 5 cases of pneumonia, one of which proved fatal, and 4 of pleurisy, all the admissions were for bronchitis. Diseases of the *digestive system* were considerably reduced in prevalence, but 5 deaths resulted from them, the average being less than 2 per 1,000 of the strength. *Urinary*

Straits Settlements.

diseases were much more prevalent than in 1871, the increase being confined to gonorrhœa, for which and its sequelæ the admissions were in the ratio of 107·4 per 1,000 of the strength. Diseases of the *skin* also were much increased in prevalence, the admissions for them being more than twice the average. The excess occurred chiefly in the 80th Regiment, at Singapore and Penang, and the diseases by which it was occasioned were pemphigus at the former station and ulcers at both. The prevalence of pemphigus was attributed by the regimental Surgeon to the excessive heat of the weather on the arrival of the regiment, and the irritation produced by the serge clothing, which the men had to wear for six weeks after their arrival in consequence of their white clothing not being ready.

Injuries.—The admissions for *accidental injuries*, though more numerous than during the preceding year, were considerably below the average. Two men of the 1st Battalion 10th Regiment, were drowned while bathing in a tank at Singapore in the beginning of January, having, in diving, become fixed in the tenacious mud which formed its bottom.

There were no deaths by suicide, and no admissions for self-inflicted injuries.

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2. Asiatic Troops.

The 19th Regiment, Madras Native Infantry, which at the termination of the previous year was distributed between Singapore, Penang, and Malacca, continued to occupy those stations during the first four months of 1872, but on the 12th May it returned to India without having been relieved, and from that date the Straits Settlements were without Asiatic troops. The strength of the 19th Regiment, reduced to the average for the year, was 222; the admissions into hospital were 358; and the deaths were 6. The ratios per 1,000 of the strength represented by these numbers are, for admissions 1612·5, and for deaths 27·01, the former being considerably below, but the latter considerably above, the corresponding ratio for 1871.

The following Table, framed from Abstract No. 18 in the Appendix, shows the admissions and deaths from the different classes and orders of diseases:—

Order.	Black Troops. Diseases.	Strength, 222. Admissions.	Deaths.	Ratio per 1,000 of Mean Strength. 1872. Admitted.	Died.	1871. Admitted.	Died.
	I. *General Diseases.*						
1	Febrile Group	75	1	337·8	4·50	663·5	3·19
2	Constitutional „	68	1	306·3	4·50	157·9	1·60
	II. *Local Diseases.*						
	Diseases of the—						
1	Nervous System	5	2	22·5	9·00	16·0	..
2	Eye	19	..	85·6	..	86·1	..
3	Ear	1	..	4·5	..	17·5	..
5	Circulatory System	1	..	4·5	..	3·2	..
8	Respiratory „	11	..	49·6	..	27·1	1·60
9	Digestive „	92	1	414·4	4·50	384·4	11·15
10	Urinary „	3	..	13·5	..	12·7	..
11	Generative „	4	..	18·0	..	6·4	..
12	Organs of Locomotion	..	..	..	..	4·8	..
13	Cellular Tissue	3	..	13·5	..	23·9	..
14	Cutaneous System	51	..	229·7	..	266·4	..
	III. *Conditions, &c.*						
	Debility	6	1	27·0	4·50	27·1	..
	IV. *Poisons*	1	..	4·5	..	..	..
	V. *Injuries.*						
2	Accidental	18	..	81·1	..	89·3	..
	Total	358	6	1612·5	27·01	1786·3	17·54

General Diseases.—One fatal case of small-pox occurred in the detachment at Malacca in April, but the disease did not spread further. The only other admissions for eruptive fevers were one for chicken-pox and one for vaccination. There were no admissions for *continued fevers*, and those for *ague* and *remittent fever* scarcely exceeded the half of the proportion for 1871. The admissions for diseases of the constitutional group, on the other hand, were in nearly double the ratio of the preceding year, the excess being due to the great prevalence of chronic rheumatism, which alone caused 243 admissions per 1,000 of the strength. There were 7 admissions for secondary syphilis, but none for primary syphilis.

Local Diseases.—*Ophthalmia* prevailed to about the same extent as in 1871, and caused a considerable amount of inefficiency, but the attacks appear to have been generally of a mild character. Diseases of the *digestive system* were more prevalent than any others, the admissions for them having been in the ratio of 414·4 per 1,000 of the strength. Dyspepsia, diarrhœa, dysentery, and colic occasioned most of the admissions, their prevalence being in the order given, but the only fatal case was one of splenitis. Diseases of the *urinary system* were extremely rare, only three admissions, all for gonorrhœa, having been occasioned by them. Diseases of the *cutaneous system*, though rather less prevalent than in 1871, caused a very high ratio of admissions, the excess being due to the prevalence of boils and ulcers.

Injuries.—The ratio of admissions for *accidental injuries* was rather below that for the preceding year, and none of the cases admitted appear to have been very serious. There were no deaths by suicide, and no admissions for self-inflicted injuries.

SANITARY REPORT.

Surgeon-Major Reade reports that considerable changes, in the composition and distribution of the force in the Command, have to be noted. The Madras

Straits Settlements.

troops, which for many years formed a portion of the garrison, were withdrawn in May, and the Royal Artillery reduced by one battery. A regiment of European Infantry, and one battery of Royal Artillery, now form the entire garrison in the Straits Settlements Command.

The general health of the troops during the past year, as regards the Head-Quarters, 80th Regiment, at Singapore, and detachment of the same corps at Penang, was not satisfactory. In the former there was at first an unusual prevalence of ague, attributable, in the opinion of the Medical Officer, to the rank vegetation, jungle, and low marshy ground by which the barracks were surrounded, and also to the youth and unacclimatized constitution of the men, many of whom were mere lads. As these, however, became more inured to the climate, there was a decided decrease in the number of admissions, and the regiment embarked for Hong Kong in a comparatively healthy condition. At Penang, in the beginning of the year, continued fever was prevalent in the detachment, 80th Regiment. There were 47 admissions from this alone, and 6 deaths. The Medical Officer considers that, though partly attributable to the youth of the men, the disease was chiefly owing to the general insalubrity of the season, the unhealthy site and bad construction of the barracks, the insufficient elevation of the floors above ground, and the very imperfect drainage. Dr. Turner records that the marked unhealthiness of the men ceased on the approach of the wet season, but that this cessation was not ascribable to any sanitary improvements, which he regards as insufficient. The detachment at Malacca has been very healthy.

Barrack accommodation.

The following is a statement of the cubic space per man afforded by the barrack accommodation in the Command :—

Singapore.—Fort Canning, 3035·46 feet ; Tanglin, 2910 feet.

Penang.—Fort Cornwallis, 2128 feet ; European Infantry Lines, 2088 feet.

Malacca.—1985·20 feet.

Singapore.—The barracks in Fort Canning and Tanglin are large, well ventilated, and commodious buildings, the former capable of accommodating 200 and the latter 570 men.

Penang.—The barrack in Fort Cornwallis is a two-storied building, the ground floor for dining-room and shoemakers' and tailors' shops, and the upper storey for a dormitory. The married quarters are on the north rampart, and are at present in great part occupied by a small detachment of European Infantry. There is accommodation for 56 men. The barracks, in which the European regiment is located, are those hitherto occupied by the Madras Native troops, and consist of four detached bungalows, arranged in parallel rows, about 100 yards apart. They are of brick, with attap roofing. Each building consists of one large room, divided longitudinally into three sections by pillars ; at either end are four rooms for non-commissioned officers. The height of the rooms is sufficient, but the Medical Officers consider that the elevation of the floors above ground is insufficient, there not being much over two feet at the highest point. Steps have been taken to rectify this, as also to improve the drainage, but the Medical Officers place little faith in the measures adopted.

Malacca.—The accommodation consists of a large building, raised on pillars 3 feet high, and containing a spacious room 115 feet long by 32 feet wide, with windows 6 feet apart on either side. It is lofty and well ventilated, and there is accommodation for 89 men.

Alterations in Barracks.

Singapore.—No alterations in, nor addition to, the accommodation for the troops in Tanglin have been deemed necessary. In Fort Canning, hospital wooden flooring has been recommended to be laid down in lieu of the present tile flooring.

Penang.—The barracks at Penang and Malacca, in which the detachment of European Infantry are located, not having been originally constructed for European troops, the following alterations and additions were deemed necessary, and have been carried out :—The hospital and two occupied barrack blocks have had wooden floors, with ventilation under them, substituted for the original solid tile floors ; all buildings requiring it have been ridge ventilated throughout ; and night latrines have been provided. The drainage of the barrack enclosure has been improved by straightening and shortening the ditches, and putting brick surface gutters round the buildings. A shed has been put up over the swimming bath, and an ablution-room provided. The

doors and window shutters of most of the inhabited rooms have been lowered ; a skittle alley, canteen bar, &c., surgery shelves and fitments have been provided; a sunshade has been provided for the exposed sentry; the ablution rooms at the hospital have been re-floored, and foot gratings provided throughout. *Straits Settlements.*

Malacca.—Rooms re-appropriated as guard rooms, cells, canteen, orderly room, and married quarters (formerly P. W. D. office and government shed), were ventilated and re-floored where necessary. Ablution and cooking accommodation was improved ; sunshades were provided for the sentries at the treasury and jail ; hired accommodation was provided for the officers ; a partition was taken down in the hospital and the ventilation improved.

Singapore.—Fort Canning.—The conservancy of the barracks, and general condition of the vicinity, are strictly attended to ; excreta removed twice daily ; refuse from cook-houses, &c., once daily. Tanglin.—There has been no nuisance from defective conservancy ; latrine refuse removed twice daily. Conservancy.

Penang.—The Medical Officer reports that, on the departure of the native troops, the latrines in the "Lines" were objectionable, but that, later, matters improved, and his recommendations met with prompt attention. Latrine refuse was removed every morning. An attempt was made to introduce the dry-earth system, but failed, as the Chinese could not be persuaded to remove the mixed soil.

Malacca.—A covered drain from the urinal was constructed. Latrine refuse removed twice daily.

Singapore.—Fort Canning.—Good and sufficient, drawn from wells, by means of pumps worked by coolies. Tanglin.—Fair quality, and abundant, from open wells sunk to various depths Water Supply.

Penang.—European Infantry Lines.—Conveyed from a mountain stream by an underground, well-ventilated culvert, several hundred yards long. As the first fifty yards of this passed through a piece of ground which had been used as a graveyard for Sepoys and other natives, and one or two recent interments having taken place close to the culvert, the Medical Officer advised the removal of the new graves, and the abolition of the cemetry, which recommendation was attended to. Fort Cornwallis.—Water is conveyed by iron pipes, leading from the base of the hill, and passing close to its foot. It is in contemplation to introduce the water into the fort by a branch leading from the main pipe.

Malacca.—Supply abundant, and quality good, from wells distant about a mile from the station. Wells in vicinity of barracks brackish ; unfit for drinking purposes.

Singapore.—Fort Canning.—Accommodation afforded by two large brick-paved rooms, detached, and containing a sufficient number of enamelled basins, and two large tubs. Tanglin.—One ablution room (containing eight basins and two large tubs) to each company (12 in all). There is also a large swimming bath which is regularly used by the men. Lavatories.

Penang.—Fort Cornwallis.—A casemate, with a wall 2½ feet high on three sides, contains all necessary requisites ; two corners are screened off for private ablution. In "Lines" they consist of three brick tanks, covered in by an attap shed, the water flowing from one to another, the first supplies the water for drinking and cooking, the second the ablution room, and the third is used as a plunge bath. There is a range of basins and gratings on two sides of the shed.

Malacca.—The ablution room consists of a building 40 feet long, 24 feet broad, and a bath house 9 feet in length and 8 in breadth is attached to it. The barracks being close to the sea, the men bathe frequently.

Singapore.—Fort Canning.—The hospital consists of four wards, capable of accommodating 22 men. In three of these the central communicates with the two side wards by open arches. Dimensions of the three wards :—Length 56 feet, breadth 53 feet, height 40 feet. The remaining ward is set apart for special cases. The building is well ventilated. The tile flooring is considered objectionable in this moist climate, and wooden flooring is about to be substituted. In a former report I stated that the addition of an upper ward to this hospital would be a great desideratum, and this could be accomplished with little cost, as the building was originally constructed with this in view. Gas is laid on throughout the whole range of barracks and hospital. Tanglin.—The hospital accommodation is all that could be desired,—two large, commodious, and well-ventilated bungalows, affording space for 56 men, each building constituting Hospitals.

Straits Settlements.

a large ward 152 feet long, 56 feet broad, and in height 26 feet in centre and 17 feet at sides. Situated on high ground; drainage good.

Latrines. Fort Canning.—The latrines are similar to those at the barracks, and have been kept in good order. Sanitary condition and drainage satisfactory. Tanglin.—The latrines are on the same plan as those attached to the barracks. Strict attention is paid to their condition.

Water Supply. Fort Canning.—Water is supplied from a well, worked by coolies, and stored in a metal tank for use. It is good, ample, and filtered previous to use. Tanglin.—Water is derived from a well similar to those supplying the barracks; it is likely to become turbid after heavy rains, but generally of good quality.

Ablution Rooms. Fort Canning.—The ablution room is a large, brick-paved apartment, with sufficient furniture. There is also a private room containing a large metal, and a tin hip, bath. Condition satisfactory. Tanglin.—The ablution rooms are fitted in a similar manner to those in barracks;—eight basins, two tubs, and a slipper bath. These arrangements appear sufficient.

Penang Hospitals. Fort Cornwallis.—The Penang Hospital is situated on level ground, about 200 or 300 yards to the west of the fort. It consists of three wards, and will accommodate 12 men. Ventilation good. European Infantry Lines.—The haspital is about 300 yards to north-west of barracks, and is composed of two wards, parallel, communicating by archways, affording accommodation for 26 men, and well ventilated. The Medical Officer reports "apparent overcrowding during the first three months, when there was an average of 24 in hospital, but this was only owing to the construction of the building, the cubic space never having (except for a few days) been under 2,000 feet.

Latrines. Drainage defective. The latrines were not in good condition at the beginning of the year, but are now more satisfactory. The tile floor (but 3 feet high) was objected to, and a plank floor substituted; ventilating apertures were also made under each window.

Water Supply. Ablution Room. The water supply is good and unlimited, and is derived from the same source as that for the barracks. In a detached building are provided sufficient means of ablution, basins, tubs, &c. Floor gratings and basin stands were supplied, and a brick gutter to carry off the effuse water was constructed.

Malacca Hospital. The Malacca Hospital is a two-storied building, situated at the foot of St. Paul's Hill, about 200 yards from the barracks. It consists of one ward in the upper storey; cubic space 19,864 feet, superficial area 1,324 feet. It can accommodate 12 men; surgery, serjeants' quarters, and store room are on the ground floor; it is ventilated by doors and windows. Medical Officer reports

Latrines. to be "in a satisfactory condition." Construction not given.

Water Supply. The water supply is reported good and ample; and is derived from wells about a mile from barracks.

Rations. The rations and diets underwent no change, and generally appear to have been of good quality. The mode of cooking is similar to that in practice in India, and the results are very satisfactory. The meals are varied according to the wishes of the men. Native cooks, under European superintendence, are employed; and English cooking utensils are used.

Amusements. The means of recreation at the disposal of the soldiers comprise libraries, reading rooms (fairly furnished with papers and periodicals), the usual games,—bagatelle, backgammon, chess, &c., and cricket, skittles, quoits, fives, &c., and occasional theatrical performances, all much appreciated. The construction of a fives court and the provision of swings, parallel bars, &c., have been recommended by Medical Officer, Penang.

Vaccination. The regulations on the subject of vaccination have been carried out. Previous to the departure of the detachment 19th Madras Native Infantry from Malacca one case of variola occurred which ended fatally, and the removal of the troops from that station was consequently postponed until the 12th May. Every man of the detachment was re-vaccinated, all necessary precautions were taken, and the hospital in which the case occurred was thoroughly disinfected. On the 17th September a man of the detachment 80th Regiment (which relieved the 19th Madras Native Infantry) was attacked. The case was a very mild one, and made a speedy recovery; he bore good marks of vaccination. H.M.S. "Adventure," with the 13th Madras Native Infantry, arrived here on the 9th May from Hong Kong, *en route* to Madras. The Medical Officer in charge reported a case of modified small-pox as having occurred some days previously; the man was at once landed, and transferred

to the small-pox hospital, and the troop-ship was disinfected with as little delay as possible. *Straits Settlements.*

Small-pox was prevalent among the Native community in Singapore and Malacca during the months of August, September, October, and November. Every precaution was taken with regard to the European troops and their families. With the exception of 6 men who bore marks of variola, all of the detachment 80th Regiment at Malacca were re-vaccinated. The garrisons of Singapore and Penang remained free from the disease.

Section II.

On the Extent of Invaliding.

During the year, 53 men of the European force were sent as invalids from this Command to England, and 25 were discharged the service at Netley, being in the ratio respectively of 36·13 and 17·04 per 1,000 of the mean strength. There was no invaliding from the Asiatic troops during the year. *China and Straits Settlements.*

	White Troops	
Mean Strength	1,467	
	Sent as Invalids to England.	Discharged as Invalids in England.
I. *General Diseases*		
Constitutional Group	11	7
II. *Local Diseases,*		
Diseases of the—		
Nervous System	7	3
Eye	1	1
Circulatory System	3	5
Absorbent „	1	..
Respiratory „	4	1
Digestive „	16	5
Urinary „	1	..
Organs of Locomotion	2	..
Cellular Tissue	1	..
Cutaneous System	1	1
III. *Conditions, &c.*		
Debility	4	2
V. *Injuries.*		
Accidental	1	..
Total	53	25
Annual ratio per 1,000 of Mean Strength.. 1872 ..	36·13	17·04
Annual ratio per 1,000 of Mean Strength.. 1862–71 ..	86·06	39·05

The ratios both of invalids sent to England and of those finally discharged the service were considerably below the average. Constitutional affections and diseases of the digestive system furnished more than half of the invalids; and of those discharged the service constitutional affections and diseases of the circulatory and digestive systems collectively furnished rather more than two-thirds.

Section III.

Mean Daily Sick.

China and Straits Settlements.

The average number constantly sick during the year was 41·30 in the European force in China, and 46·39 in that in the Straits Settlements; 14·45 in the Asiatic force in China, and 10·29 in that in the Straits Settlements.

The following Table gives the usual information calculated from these numbers and the mean strengths:—

		European Troops.		Asiatic Troops.	
		China.	Straits Settlements.	China.	Straits Settlements.
Ratio per 1,000 of Strength constantly Sick	1872 ..	53·71	65·52	40·82	45·35
	1864–71	77·43	*54·56	65·43	†
		days.	days.	days.	days.
Average Sick time to each Soldier	1872 ..	19·60	23·92	14·90	16·91
	1864–71	28·26	*19·91	23·88	†
Average duration of Cases ..	1872 ..	10·30	10·51	18·97	10·49
	1864–71	14·54	*14·42	21·04	†

* Average of four years, 1868–71.

† There are no previous Returns of average constantly sick of Asiatic Troops at the Straits Settlements.

Compared with the results for 1871, this shows a reduction in all the particulars in the European force in China, but an increase in all, except the average duration of the cases, in that at the Straits Settlements, and a reduction in all with the same exception in the Asiatic troops in China. Compared with the average of the previous 8 years, the reduction in all particulars in both the European and the Native force in China was very considerable.

Section IV.

Influence of Age on the Mortality.

In consequence of the movements of the troops the information necessary to complete the usual table under this head was not furnished.

XI.—ON THE HEALTH OF THE TROOPS SERVING IN INDIA.

Section I.

Sickness and Mortality.

India. The average strength of the European troops serving in the Indian Commands in 1872 was 59,248 men; the number admitted into hospital was 87,159; and the deaths among them amounted to 1,499, of which 1,439 occurred in India, and 60 were those of invalids on the passage home or at Netley. The ratios per 1,000 of the strength represented by these numbers are, for admissions 1,471, and for deaths 25·30, the former being slightly, and the latter considerably, above the corresponding ratio for the preceding year. The ratio of admissions is lower by 53 per 1,000 of the strength, and that of deaths is higher by ·30 per 1,000 of the strength than the average for the previous 10 years. The admissions and deaths in the several Presidencies were as follows:—

	Average Strength.	Admissions into Hospital.	Deaths.			Ratio per 1,000 of Mean Strength.			
						1872.		1862–71.	
			In India.	Of Invalids.	Total.	Admitted.	Died.	Admitted.	Died.
Bengal	36,839	54,946	1,016	39	1,055	1,491	28·64	1,588	26·96
Madras	11,511	15,240	218	11	229	1,324	19·89	1,367	23·14
Bombay	10,898	16,973	205	10	215	1,557	19·72	1,461	20·38

Bombay furnished the highest ratio of admissions, and Bengal the highest ratio of deaths; Madras the lowest ratio of admissions, and Bombay the lowest ratio of deaths. In Bengal the ratio of admissions was considerably below, but that of deaths was considerably above the average for the preceding 10 years. In Madras both ratios were considerably below that average. In Bombay the ratio of admissions was above it, but that of deaths was slightly below it.

I.—Bengal.

STATISTICAL REPORT.

Bengal. The average strength of the European troops serving in the Bengal Command during the year was 36,839; the admissions into hospital among them were 54,946; and the deaths, including 39 of invalids on the passage home, or at Netley, amounted to 1,055. The ratios per 1,000 of the strength represented by these numbers are, for admissions 1491·5, and for deaths 28·64, the former being slightly, and the latter considerably above the corresponding ratio for 1871. Both are below the average for the three years from 1869 to 1871, but the ratio of deaths is above the average for the ten years from 1862 to 1871.

The admissions and deaths from the different classes and orders of diseases are shown in the following Table, framed from Abstract No. 19 in the Appendix:—

Bengal.

Orders.	Diseases.	Strength, 36,839.				Ratio per 1,000 of Mean Strength.			
			Deaths.			1872.		1869–71.	
		Admitted.	In the Command.	Of Invalids.	Total.	Admitted.	Died.	Admitted.	Died.
	General Diseases.								
1	Febrile Group ..	23,049	521	1	522	625·7	14·17	727·7	10·43
2	Constitutional Group	5,634	47	10	57	152·9	1·55	173·3	2·75
	Local Diseases. Diseases of the—								
1	Nervous System ..	759	89	..	89	20·6	2·42	20·4	2·75
2	Eye	904	..	..	..	24·5	..	25·2	..
3	Ear	243	..	..	..	6·6	..	7·2	..
4	Nose	18	..	..	..	·5	..	·6	·02
5	Circulatory System ..	747	47	8	55	20·3	1·49	15·7	1·78
6	Absorbent „ ..	536	..	..	..	14·6	..	16·9	..
7	Ductless Glands ..	3	..	..	..	·1	..	·1	·01
8	Respiratory System ..	2,106	49	4	53	57·2	1·44	54·8	1·44
9	Digestive „ ..	9,673	187	10	197	262·5	5·35	264·3	7·42
10	Urinary „ ..	3,714	6	1	7	100·8	·19	103·8	·48
11	Generative „ ..	521	..	..	..	14·1	..	16·0	..
12	Organs of Locomotion	184	3	1	4	5·0	·11	5·2	·02
13	Cellular Tissue ..	489	..	..	..	13·3	..	12·1	·06
14	Cutaneous System ..	2,319	1	1	2	63·0	·05	68·7	·01
	III. *Conditions, &c.*								
	Debility	799	1	3	4	21·7	·11	14·7	·13
	IV. *Poisons* ..	159	10	..	10	4·3	·27	5·8	·43
	V. *Injuries.*								
2	Accidental	3,021	27	..	27	82·0	·73	86·6	·88
3	Homicidal	4	3	..	3	·1	·08	·3	·06
4	Self-inflicted	7	25	..	25	·2	·68		·58
6	Judicial	4	..	..	..	·1	..	..	·01
	VI. *Surgical Operations*	20	..	..	..	·5	..	·3	·02
	No appreciable disease	33	..	..	..	·9	..	·8	..
	Total	54,946	1,016	39	1,055	1491·5	28·64	1620·5	29·28
	Average of 10 years 1862–71.. ..	..	..	..	..	1587·9	26·96	..	..

General Diseases.—Compared with the results for 1871, there was a slight increase in the prevalence of this class of diseases, confined entirely to the febrile group, and a great increase in the mortality caused by it, also confined to the febrile group.

Both admissions and deaths from diseases of the constitutional group were in a lower ratio than during the preceding year, and considerably below the average.

The admissions and deaths from the principa diseases of this class are shown in the following Table :—

Strength	36,839	Died.			Ratio per 1,000 of Mean Strength.			
					1872.		1869–71.	
General Diseases.	Admitted.	In Command.	Invalids.	Total.	Admitted.	Died.	Admitted.	Died.
Febrile—								
Eruptive Fevers	43	8	1	9	1·2	·24	1·9	·20
Continued „	8,733	70	..	70	237·1	1·90	168·4	2·04
Paroxysmal „	13,558	48	..	48	368·0	1·30	543·9	2·42
Malignant Cholera ..	588	387	..	387	16·0	10·51	7·7	5·59
Choleraic Diarrhœa ..	..	..	..	..	..	..	·7	..
Influenza	30	..	..	..	·8	..	1·9	..
Erysipelas	81	5	..	5	2·2	·14	2·0	·08
Other Diseases	16	3	..	3	·4	·08	1·2	·08
Total	23,049	521	1	522	625·7	14·17	727·7	10·41
Constitutional—								
Rheumatism	1,864	..	..	..	50·6	..	54·3	·03
Syphilis	3,139	1	1	2	85·2	·06	97·6	·18
Scrofula, Phthisis, &c. ..	388	41	9	50	10·5	1·35	11·7	2·30
Scurvy and Purpura ..	17	1	..	1	·5	·02	·6	..
Anæmia	199	2	..	2	5·4	·06	8·0	·05
Other Diseases	27	2	..	2	·7	·06	1·0	·18
Total	5,634	47	10	57	152·9	1·55	173·2	2·74

Eruptive Fevers were rather more prevalent, and considerably more fatal, than in 1871, the increase in both respects being confined to small-pox, from which there were 25 admissions and seven deaths. The other admissions included under this head were eight for chicken-pox, eight for measles, and two for scarlet fever, and the only other death was from the last of these diseases.

Continued Fevers were more prevalent than during the preceding year, the ratio of admissions for them being higher by 105 per 1,000 of the strength, but the ratio of mortality from them was almost unchanged. The increase in the ratio of admissions was caused by the epidemic of dengue, which prevailed throughout the Command during the three last quarters of the year, and caused 4,026 admissions into hospital, but no deaths. The other diseases included under this head were enteric fever, from which there were 104 admissions and 51 deaths; cerebro-spinal fevers, from which there were 21 admissions and 6 deaths; simple continued fever, from which there were 3,212 admissions and 13 deaths, and febricula, from which there were 1,370 admissions, but no deaths.

Paroxysmal Fevers were considerably less prevalent than in 1871, the ratio of admissions for them being lower by 85·8 per 1,000 of the strength. The deaths from them also were fewer by ·68 per 1,000 of the strength. Both admissions and deaths were much below the average.

Malignant Cholera was greatly more prevalent and more fatal than during the preceding year, the admissions from it having been 588, and the deaths 387. These numbers, in which three admissions and two deaths returned under "simple cholera," are not included, are higher than those for any of the preceding 10 years, except 1867 and 1869. The ratio per 1,000 of the strength represented by the former is more than twice, and that represented by the latter is nearly twice, the average ratio for the three years from 1869 to 1871. Only one case (at Allahabad) is shown in the first Quarterly Return for the Command; but in April there were four cases and three deaths at

Bengal. Benares, and four cases, all fatal, at Sealkote; in May there were 11 deaths at Cawnpore, one at Allahabad, one at Lucknow, and one at Agra; and from this date the disease continued to extend in a northerly direction, until the whole of Northern India had been invalided by it.

The admissions and deaths in the several quarters of the year were as follows:—

	Admissions.	Deaths.
Ist Quarter.. ..	1	1
IInd „	61	42
IIIrd „	449	287
IVth „	77	57

From this it will be seen that the period during which the epidemic was greatly most severe was that of the rains. Its prevalance in the several divisions will be stated subsequently; but it may be mentioned here that it fell with the greatest severity on the Punjaub, and, in illustration of its course, that the date of the occurrence of the first case among the troops at each of the stations attacked there was as follows:—

Kussowlee	5th July.
Subathoo	12th „
Fort, Lahore	16th „
Rawul Pindee	18th „
Murree	16th „
Dugshaie	29th „
Meean Meer	1st August.
Jullundur	22nd „
Phillour	23rd „
Umballa	30th „
Attock	5th October.
Peshawur	10th „

The corps which suffered most severely were the 37th, at Meean Meer, in which there were 99 admissions and 63 deaths; the A Battery of the A Brigade, Royal Horse Artillery, and the H Battery of the 8th Brigade, Royal Artillery, at the same station in which respectively the admissions were 16 and 13, and the deaths 13 and 9; the 1st Battalion, 6th Regiment, at Peshawur, in which the admissions were 39, and the deaths 31, and the 55th, at the same station, in which they were respectively 27 and 21; the 2nd Battalion of the 19th, at Allahabad, in which they were 43 and 24; the 65th, at Agra, in which they were 28 and 18; the 85th, at Dugshaie, in which they were 29 and 17; the 26th at Fyzabad, in which they were 28 and 16, and the E Battery, 16th Brigade, Royal Artillery, at the same station, in which they were 11 and 6; the 54th, at Jullundur, in which they were 18 and 17; the 1st Battalion of the 8th, at Cawnpore, in which they were 23 and 16; the 1st Battalion of the 11th, at Morar, in which they were 22 and 7; the 2 Batteries of Horse Artillery at Meerut, in which they were 22 and 14; and the 105th Regiment at the same station, in which they were 33 and 24.

In the epidemic generally, the fatality of the disease was unusually great, the proportion of deaths to cases among the men having been 658·2 per 1,000. Including all cases among officers, men, women, and children of Her Majesty's British service there were 856 admissions and 564 deaths, the proportion of deaths to attacks represented by these number being 658·9, which is almost identical with that for the men alone.

Rheumatism was rather less prevalent than during the preceding year; and there was a reduction of 14 per 1,000 of the strength in the ratio of admissions for *syphilis*.

Scrofula and Phthisis caused a slightly higher ratio of admissions than in 1871, but a much lower ratio of mortality, and both ratios were below the average.

In the admissions for *anæmia* there was a considerable reduction, attributable probably to the reduced prevalence of malarious fevers.

Local Diseases.—Compared with the results for 1871, there was no important change in the prevalence of any of the orders of this class, nor did any of them much exceed or fall below, the average of former years. The ratio of admissions for *diseases of the nervous system* was 3·3 per 1,000 of the strength, and that of deaths from them was ·93 per 1,000 of the strength above the corresponding ratio for the preceding year. The most fatal disease of the order was sunstroke, from which there were 118 admissions and 44 deaths; and next to it in the order of fatality was apoplexy, from which there were 26 admissions and 18 deaths. From inflammatory affections of the brain or its membranes there were 31 admissions and 11 deaths. Two deaths occurred from hydrophobia; one in the 1st Battalion, 11th Regiment, at Morar, the other in the F Battery of the 16th Brigade Royal Artillery, at Meerut. The particulars of the former case are not given in the regimental report. The latter followed the bite of a pariah dog, after an interval of about two months, the bitten parts having been incised and cauterized, but not until two days after the receipt of the injury, the man not havin reported it sooner. Death took place in 18 hours from the commencement of the symptoms.

In *diseases of the circulatory system* also there was a slight increase, the ratio of admissions for them being higher by 2·7 per 1,000 of the strength, but the mortality from them was lower than during the preceding year, and below the average. Palpitation caused 63 per cent. of the admissions under this order. The most fatal disease included in it was aneurism of the aorta, and the next to it was valve disease of the heart.

Diseases of the respiratory system were rather less prevalent, and also slightly less fatal than in 1871. Pneumonia was greatly the most fatal disease of this order.

Diseases of the digestive system were slightly more prevalent, and also more fatal than during the preceding year, the ratio of admissions being higher by 10·6, and that of deaths by ·67 per 1,000 of the strength. Both ratios, however, are below the average, that of deaths considerably so. Diarrhœa was the most prevalent disease of the order, and hepatitis and dysentery were the most fatal ones. The deaths from the last two were considerably in excess of those in 1871.

Diseases of the urinary system were rather less prevalent, the reduction in the ratio of admissions for them amounting to 6·5 per 1,000 of the strength. It took place chiefly in gonorrhœa and its sequelæ, for which the admissions were in the ratio of 96·9 per 1,000 of the strength.

Conditions, &c.—The admissions for debility were in a higher ratio than in 1871 by 5, and above the average for the three years from 1869 to 1871 by 7 per 1,000 of the strength. The prevalence of dengue may, perhaps, account for the increase.

Poisons.—The admissions under this head were in almost the same ratio as in 1871, but the mortality was slightly reduced. Both were below the average. With three exceptions, all the admissions were for delirium tremens, or poisoning by alcohol, from which together they were in the ratios of 4·23 per 1,000 of the strength, the deaths being in that of ·27 per 1,000 of the strength.

Injuries.—There was a decrease of 6 per 1,000 of the strength in the ratio of admissions for accidental injuries, and of ·17 in that of deaths from them. Of the 27 accidental deaths recorded, 15 were by drowning, 5 by fracture, 2 by choking, 3 by wounds, 1 by multiple injury (by being run over by a railway train), and 1 by concussion of the brain. There were 3 homicidal deaths; all by rifle shot, and 25 deaths by suicide, the mode of self-destruction adopted being by gunshot in 19 cases, drowning in 2, and by the following—hanging, cut-throat, poisoning by corrosive sublimate, and multiple injury, 1 each. The proportion of deaths by suicide was 11 per 1,000 of the strength higher than in 1871, and ·10 above the average of the preceding three years.

The following Table shows the admissions and deaths during the year at the principal stations in the Command:—

Bengal.

Stations.		Average Annual Strength.	Admitted into Hospital.	Died in India.	Annual Ratio per 1,000. 1872. Admitted.	1872. Died.	1865-71. Admitted.	1865-71. Died.
Presidency	Calcutta ..	812	1,637	28	2016·0	18·58	1457·2	23·53
	Dum-Dum ..	695	990		1424·5			
	Barrackpore ..	427	982	10	2299·8	23·42	1721·7	33·96
	Hazareebaugh..	878	983	6	1119·6	6·83	1404·8	19·51
	Darjeeling ..	83	79	2	951·8	24·10	..	..
Allahabad	Allahabad ..	976	1,636	42	1676·2	43·03	1785·6	50·51
	Cawnpore ..	815	2,004	36	2458·9	44·17	1519·4	21·34
	Dinapore ..	828	1,558	18	1831·6	21·74	1476·0	23·98
	Benares ..	495	725	8	1464·6	16·12	1745·2	28·12
	Chuna	66	107	1	1621·2	15·15	..	..
Oude ..	Lucknow ..	2,377	3,482	59	1376·6	24·82	1229·3	26·29
	Seetapore ..	603	549	7	903·0	11·51	1087·7	18·99
	Fyzabad ..	960	947	36	986·4	37·50	1088·9	26·58
	Fort Munchee Bhawn	58	164	..	2827·6	..	..	..
Saugor ..	Saugor.. ..	445	698	3	1564·9	6·74	2149·9	36·65
	Nowgong ..	308	552	8	1792·2	25·97	1463·0	25·10
	Jubbulpore ..	448	347	1	774·6	8·95	2145·7	38·53
	Puchmurree ..	81	222	2	2734·4	24·69	..	..
Rohilcund	Bareilly ..	735	880	7	1197·3	9·52	949·1	13·17
	Shahjehanpore	377	342	5	905·1	13·26	1435·2	21·15
	Moradabad ..	205	174	2	848·8	9·76	1058·4	16·00
	Raneekhet ..	477	571	18	1197·1	37·74	..	..
Gwalior	Morar	1,075	1,593	13	1481·9	12·09	2366·9	41·84
	Fortress Gwalior	354	450	3	1268·3	8·47	1368·6	27·96
	Jhansi	387	1,078	5	2785·5	12·92	2483·3	20·71
Meerut ..	Meerut ..	1,271	2,743	100	2388·3	78·68	1642·9	33·08
	Agra	1,051	1,346	31	1280·7	29·43	1409·8	21·57
	Delhi	532	1,304	17	2451·1	31·96	1854·6	31·85
	Muttra ..	341	529	9	1551·3	26·33	1113·8	15·01
	Roorkee ..	345	554	11	1605·8	31·88	1468·5	17·46
	Futtyghur ..	143	221	1	1545·5	6·99	1332·7	20·55
Sirhind ..	Umballa ..	1,302	1,787	33	1372·5	25·35	1405·4	16·91
	Jullundur ..	807	874	29	1083·0	35·94	1747·8	20·85
	Dugshaie ..	801	679	26	847·7	32·46	917·4	8·03
	Subathoo ..	794	681	7	857·7	8·82	1264·0	19·64
	Jutogh.. ..	70	43	1	614·3	14·29	..	..
	Chuckratta ..	767	457	8	595·8	10·43	..	..
Lahore ..	Lahore.. ..	1,074	2,684	131	2496·8	121·86	2122·6	34·01
	Ferozepore ..	1,116	1,305	14	1169·3	12·54	1500·0	16·21
	Mooltan ..	822	1,261	16	1534·1	19·46	1316·6	21·16
	Bhagsoo ..	56	29	..	517·9	..	..	..
	Fort Kangra ..	15	12	..	800·0	..	..	..
	„ Govindghur	283	397	6	1402·9	21·21	..	..

Stations.		Average Annual Strength.	Admitted into Hospital.	Died in India.	Annual Ratio per 1,000. 1872. Admitted.	1872. Died.	1865-71. Admitted.	1865-71. Died.
Rawul Pindee..	Sealkote ..	1,077	1,596	22	1481·9	20·43	1337·4	11·26
	Rawul Pindee..	1,723	2,085	41	1210·1	23·80	1680·2	14·35
	Working Parties	317	308	..	971·6	..	?.	..
	Campbellpore ..	134	296	2	2208·9	14·93	1365·0	17·29
	Attock.. ..	179	445	5	2486·0	27·93	2045·3	22·67
	Dera Ismail Khan	99	232	5	2343·4	50·51	1272·5	9·99
Peshawur..	Peshawur ..	1,518	4,491	63	2958·5	41·50	2585·2	52·21
	Nowshera ..	644	1,656	7	2571·4	10·87	2216·6	23·54
	Cheratt ..	453	426	12	940·4	26·49	..	..
Troops on March, detached, &c.		2,062	1,490	18	722·6	8·73	..	..
Convalescent Stations and Depôt Hospitals ..		1,545	2,730	68	1767·0	44·01	..	..

The ratio of admissions was highest at Peshawur, where it exceeded that for the preceding year by 696·6 per 1,000 of the strength, and the average of the seven preceding years by 373·3. The excess was due chiefly to the increased prevalence of malarious fever, more particularly in the 55th Regiment, in which the ratio of admissions, for that disease alone was 1612·5 per 1,000 of the strength, and C Battery, A Brigade, Royal Horse Artillery, in which it was 1664·5 per 1,000 of the strength. In the 1st Battalion of the 6th Regiment the ratio was only 674·6, but in it the admissions for simple continued fever, of which there were only 20 in the 55th, amounted to 258·5 per 1,000 of the strength. At Jhansi, in the 106th Regiment, the ratio of admissions for malarious fever was 1,165, and at Nowshera, in the 2nd Battalion of the 60th Rifles, it was 1188·9 per 1,000 of the strength. At the latter station the excess was attributed to the inundation of a large extent of the surface by the overflow of the Cabul river.

The stations at which the admissions were more than double the mean strength, were as follows, their order being that of the highest ratio, those at which the mean strength was less than 100 men being omitted:— Peshawur, Jhansi, Nowshera, Lahore, Attock, Cawnpore, Delhi, Meerut, Barrackpore, Campbellpore, and Calcutta. The stations which furnish the lowest ratio of admissions, those at which the strength was under 100 being omitted, were Chuckratta, Jubbulpore, Dugshaie, Moradabad, Subathoo, Seetapore, Shahjehanpore. Cheratt, and Fyzabad, at all of which the mean strength exceeded the number of admissions. Their order is that of the lowest ratio of admissions.

The ratio of mortality was very high at the following stations, chiefly from the epidemic of cholera, the deaths from which at each, and the total deaths, are added.

Bengal.

	Total Deaths.	Deaths from Cholera.
Lahore	131	95
Meerut	100	47
Cawnpore	36	17
Allahabad	42	25
Peshawur	63	40
Fyzabad	36	21
Jullundur	29	6
Dugshaie	26	19
Convalescent Depôts ..	68	36

The particular depôts at which cholera prevailed were Kussowlee and Murree, at which respectively the deaths from all causes were 31 and 26, and those from cholera were 13 and 23.

The ratio of deaths was lowest at Saugor, Hazareebaugh, Futtyghur, Gwalior, Subathoo, Jubbulpore, Bareilly, and Moradabad, at all of which it was below one per cent. of the strength.

The admissions and deaths from the different classes and orders of diseases in each of the Military Divisions in the Command are shown in the following Tables :—

Order.	Stations	Presidency.		Allahabad.		Oude.		Saugor.		Rohilcund.		Gwalior.		Meerut.		Sirhind.		Lahore.		Rawul Pindee.		Peshawur.		Depôts.		On the March.	
	Strength	2,895		3,180		4,003		1,282		1,794		1,816		3,746		4,541		3,366		3,529		2,615		1,545		2,062	
	Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted	Died
	I. *General Diseases.*																										
1	Febrile Group	1,782	10	2,556	57	1,850	57	1,025	3	389	7	1,669	1	3,163	90	1,268	58	2,595	110	1,670	32	4,151	56	650	38	355	2
2	Constitutional ,, ...	467	5	590	3	560	4	168	1	266	...	260	1	608	11	605	5	480	6	541	1	484	5	502	3	261	2
	II. *Local Diseases.*																										
	Diseases of the—																										
1	Nervous System	93	6	102	14	47	9	23	2	46	5	44	4	107	12	57	6	73	15	84	5	57	5	27	3	32	3
2	Eye	108	...	130	...	114	...	15	...	35	...	29	...	96	...	110	...	101	...	58	..	65	...	36	...	17	...
3	Ear	32	...	33	...	31	...	1	...	11	...	6	...	15	...	19	...	24	...	33	...	24	...	8	...	2	...
4	Nose	...	...	...	...	1	...	...	...	...	...	1	...	...	...	3	...	5	...	5	...	3	...	...	...	...	...
5	Circulatory System ...	58	4	46	...	81	8	8	2	85	...	43	3	50	5	75	4	131	9	59	6	42	2	51	1	8	3
6	Absorbent ,, ...	61	...	84	...	118	...	13	...	24	...	21	...	53	...	46	...	24	...	29	...	20	...	36	...	23	...
7	Ductless Glands ...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...
8	Respiratory System ...	149	3	153	1	131	2	46	...	117	4	129	3	318	10	219	5	236	4	209	6	225	2	135	6	82	3
9	Digestive ,, ...	872	13	1,100	21	862	17	242	7	467	14	376	6	1,128	29	924	23	1,008	20	921	13	767	8	765	15	271	1
10	Urinary ,, ...	340	...	474	2	483	...	130	...	227	...	160	...	405	2	441	...	292	...	350	1	163	...	148	1	164	...
11	Generative ,, ...	54	...	45	...	71	...	24	...	18	...	24	...	60	...	45	...	38	...	64	...	43	...	32	...	21	...
12	Organs of Locomotion	18	...	14	...	24	...	3	...	4	...	6	...	29	2	27	1	15	...	22	...	10	...	20	...	3	...
13	Cellular Tissue ...	31	...	57	...	65	...	11	...	14	...	15	...	56	...	42	...	48	...	72	...	38	...	27	...	27	...
14	Cutaneous System ...	252	...	227	...	286	...	37	...	92	...	151	1	308	...	193	...	263	...	251	...	158	...	83	...	63	...
	III. *Conditions, &c.*																										
	Debility	31	...	111	...	108	...	...	...	22	...	27	...	47	...	72	...	68	...	129	...	60	...	99	...	14	1
	IV. *Poisons.*	6	1	13	...	9	1	3	...	8	...	9	...	26	4	20	...	24	1	7	2	19	...	9	...	2	1
	V. *Injuries.*																										
2	Accidental	297	1	289	3	292	1	70	1	139	2	145	...	291	...	344	3	255	1	449	8	242	4	97	1	141	2
3	Homicidal	1	...	...	...	...	...	...	1	...	...	2	...	...	...	...	1	...	...	1	1	...	...	...	...	...	...
4	Self-inflicted	2	3	2	4	1	3	...	...	...	...	1	2	1	4	1	8	...	1	1	...	...	...	...	...	...	...
	VI.																										
	Surgical Operations ...	4	...	...	...	...	...	...	...	2	...	...	...	3	...	3	...	1	...	2	...	1	...	4	...	3	...
	Not yet diagnosed ...	3	...	2	...	1	...	...	...	...	...	...	...	...	...	1	...	2	...	2	...	1	...	...	...	...	...
	No appreciable disease ...	10	...	2	...	6	...	...	...	1	...	3	...	4	...	4	...	5	...	3	...	...	...	1	...	1	...
	Total	4,671	46	6,030	105	5,142	102	1,819	17	1,967	32	3,121	21	6,768	169	4,521	114	5,688	167	4,962	75	6,573	82	2,730	68	1,490	18

Ratio per 1,000 of Mean Strength.

Order.	Stations	Presidency		Allahabad.		Oude.		Saugor.		Rohilcund.		Gwalior.		Meerut.		Sirhind.		Lahore.		Rawul Pindee.		Peshawur.		Depôts.		On the March.	
	Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
	I. *General Diseases.*																										
1	Febrile Group ...	615·5	3·45	803·8	17·93	462·2	14·24	799·5	2·34	216·8	3·90	919·0	·55	844·4	24·03	279·2	12·77	770·9	32·68	473·2	9·07	1587·4	21·41	420·7	24·59	172·2	·97
2	Constitutional ,, ...	161·3	1·72	185·5	·94	139·9	1·00	131·1	·78	143·3	...	143·2	·55	162·3	2·94	133·2	1·10	142·6	1·78	153·3	·28	185·1	1·91	324·9	1·94	126·6	·97
	II. *Local Diseases.*																										
	Diseases of the—																										
1	Nervous System ...	32·1	2·07	32·1	4·40	11·7	2·24	17·9	1·56	25·6	2·79	24·2	2·20	28·6	3·20	12·6	1·32	21·7	4·45	23·8	1·42	21·8	1·91	17·5	1·94	15·5	1·46
2	Eye	37·3	...	40·9	...	28·5	...	11·7	...	19·5	...	16·0	...	25·6	...	24·2	...	30·0	...	16·4	...	24·9	...	23·3	...	8·2	...
3	Ear ,, ...	11·1	...	10·4	...	7·7	...	·8	...	6·1	...	3·3	...	4·0	...	4·2	...	7·1	...	9·4	...	9·2	...	5·2	...	1·0	...
4	Nose	...	...	...	...	·3	...	...	...	...	...	·6	...	...	...	·7	...	1·5	...	1·4	...	1·2	...	...	...	...	...
5	Circulatory System ...	20·0	1·38	14·5	...	20·2	2·00	6·2	1·56	47·4	...	23·7	1·65	13·3	1·33	16·5	·38	38·9	2·67	16·7	1·70	16·1	·77	33·0	·65	3·9	1·46
6	Absorbent ,, ...	21·1	...	26·4	...	29·5	...	10·1	...	13·4	...	11·6	...	14·2	...	10·1	...	7·1	...	8·2	...	7·6	...	23·3	...	11·1	...
7	Ductless Glands ...	...	...	...	...	·3	...	...	...	...	...	...	...	...	...	·4	...	...	...	...	...	...	...	...	...	...	...
8	Respiratory System ...	51·5	1·04	48·1	·31	32·7	·50	35·9	...	65·2	2·23	71·0	1·65	84·9	2·67	48·2	1·10	70·1	1·19	59·2	1·70	86·0	·77	87·4	3·88	39·8	1·46
9	Digestive ,, ...	301·2	4·49	345·9	6·60	215·3	4·25	188·8	5·46	260·3	7·80	207·0	3·30	301·1	7·74	203·5	5·06	299·5	5·94	261·0	3·68	293·3	3·06	495·1	9·71	131·4	·48
10	Urinary ,, ...	117·4	...	149·1	·63	120·7	...	101·4	...	126·5	...	88·1	...	103·1	·53	97·1	...	86·7	...	99·2	·28	62·3	...	95·8	·65	79·5	...
11	Generative ,, ...	18·7	...	14·1	...	17·7	...	18·7	...	10·0	...	13·2	...	16·0	...	9·9	...	11·3	...	18·1	...	16·4	...	20·7	...	10·2	...
12	Organs of Locomotion	6·2	...	4·4	...	6·0	...	2·3	...	2·2	...	3·3	...	7·7	·53	5·9	·22	4·5	...	6·2	...	3·8	...	12·9	...	1·4	...
13	Cellular Tissue ...	10·7	...	17·9	...	16·2	...	8·6	...	7·8	...	8·3	...	15·0	...	9·3	...	14·3	...	20·4	...	14·5	...	17·5	...	13·1	...
14	Cutaneous System ...	87·0	...	71·4	...	71·4	...	28·9	...	51·3	...	33·1	·55	82·2	...	42·5	...	78·1	...	71·1	...	60·4	...	53·7	...	30·6	...
	III. *Conditions, &c.*																										
	Debility	10·7	...	34·9	...	27·0	...	...	...	12·3	...	14·9	...	12·5	...	15·9	...	20·2	...	36·6	...	22·9	...	64·1	...	6·8	·48
	IV. *Poisons* ...	2·1	·35	4·1	...	2·2	·25	2·3	...	4·5	...	5·0	...	6·9	1·07	4·4	...	7·1	·30	2·0	·57	7·3	...	5·8	...	1·0	·48
	V. *Injuries.*																										
2	Accidental	102·6	·35	90·9	·94	72·9	·25	54·6	·78	77·5	1·11	79·8	...	77·7	...	75·8	·66	75·8	·30	127·2	2·27	92·5	1·53	62·8	·65	68·4	·97
3	Homicidal	·3	...	...	...	...	...	...	·78	...	...	1·1	...	...	...	...	·22	...	...	·3	·28	...	...	...	...	...	...
4	Self-Inflicted	·7	1·04	·6	1·26	·3	·75	...	...	...	...	·6	1·10	·3	1·07	·2	1·76	...	·30	·3	...	...	...	...	...	...	...
	VI.																										
	Surgical Operations ...	1·4	...	...	...	...	...	...	...	1·1	...	...	...	·8	...	·7	...	·3	...	·6	...	·4	...	2·6	...	1·4	...
	Not yet diagnosed ...	1·0	...	·6	...	·3	...	...	...	...	...	...	...	...	...	·2	...	·6	...	·6	...	·4	...	...	...	...	...
	No appreciable disease	3·5	...	·6	...	1·5	...	...	...	·6	...	1·6	...	1·1	...	·9	...	1·5	...	·9	...	...	...	·6	...	·5	...
	Total	1613·4	15·89	1896·2	33·01	1284·5	25·48	1418·8	13·26	1096·4	17·83	1718·6	11·55	1806·7	45·11	995·6	25·09	1689·8	49·61	1406·1	21·25	2513·5	31·36	1766·9	44·01	722·6	8·73

General Diseases.

Stations	Presidency.		Allahabad.		Oude.		Saugor.		Rohilcund.		Gwalior.		Meerut.		Sirhind.		Lahore.		Rawul Pindee.		Peshawur.		Depôts.		On the March.	
Strength	2,895		3,180		4,003		1,282		1,794		1,816		3,746		4,541		3,366		3,529		2,615		1,545		2,062	
General Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Febrile—																										
Eruptive Fevers	...	...	2	2	5	...	3	..	1	...	...	...	2	1	3	1	8	...	15	3	1	1	...	...	1	...
Continued ,,	1,069	4	1,778	4	1,439	9	194	...	74	5	100	...	1,313	11	775	11	594	7	775	12	479	7	58	...	82	...
Paroxysmal ,,	706	4	698	5	322	2	819	1	310	2	1,560	1	1,731	5	414	8	1,832	4	827	6	3,609	7	539	2	268	1
Malignant Cholera	3	2	72	46	73	46	2	2	1	...	1	...	94	72	54	37	150	97	26	9	54	40	50	36	1	...
Influenza	...	...	1	...	...	...	6	...	...	...	4	...	7	...	1	...	1	...	7	...	2	...	...	...	1	...
Erysipelas	2	...	4	...	7	...	...	...	2	...	3	...	8	1	19	1	10	1	18	1	1	...	2	...	2	1
Other Diseases of this Group	2	...	1	...	4	...	1	...	1	...	1	...	8	...	2	...	...	1	2	1	5	1	1	...	...	...
Total	1,782	10	2,556	57	1,850	57	1,025	3	389	7	1,669	1	3,163	90	1,268	58	2,595	110	1,670	32	4,151	56	650	38	355	2
Constitutional—																										
Rheumatism	132	...	179	...	193	...	60	...	94	...	154	...	256	...	232	...	133	...	201	...	71	...	120	...	81	...
Syphilis	253	1	376	...	307	...	80	...	153	...	75	...	273	...	339	...	281	...	272	...	368	...	311	...	155	...
Scrofula, Phthisis, &c.	74	4	21	3	36	3	18	1	10	...	18	1	33	10	27	4	40	5	42	1	14	5	34	3	13	1
Scurvy and Purpura	1	...	...	...	...	...	1	...	1	...	1	...	5	1	...	...	3	...	4	...	1	...	...	...	...	...
Anæmia	6	...	11	...	22	1	6	...	3	...	10	...	39	...	4	1	18	...	20	...	26	...	33	...	9	...
Other Diseases of this Group	1	...	3	...	2	...	3	...	...	...	2	...	2	...	3	...	5	1	2	...	4	...	4	...	3	1
Total	467	5	590	3	560	4	168	1	266	...	260	1	608	11	605	5	480	6	541	1	484	5	502	3	261	2

Ratio per 1,000 of Mean Strength

Stations	Presidency.		Allahabad.		Oude.		Saugor.		Rohilcund.		Gwalior.		Meerut.		Sirhind.		Lahore.		Rawul Pindee.		Peshawur.		Depôts.		On the March.	
General Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Febrile—																										
Eruptive Fevers	...	...	·6	·63	1·3	...	2·3	...	·6	...	...	...	·6	·27	·7	·22	2·4	...	4·2	·85	·4	·38	...	...	·5	...
Continued ,, ...	369·2	1·38	559·1	1·26	359·5	2·25	151·3	...	41·2	2·79	55·1	...	350·5	2·94	170·6	2·42	176·5	2·08	219·6	3·40	183·2	2·68	37·5	...	39·7	...
Paroxysmal ,, ...	243·9	1·38	219·5	1·57	80·4	·50	638·8	·78	172·7	1·11	859·0	·55	462·1	1·33	91·2	1·76	544·3	1·18	234·3	1·70	1380·1	2·68	348·9	1·29	130·0	·48
Malignant Cholera	1·0	·69	22·7	14·46	18·2	11·49	1·6	1·56	·6	...	·5	...	25·1	19·22	11·9	8·15	44·6	28·82	7·4	2·55	20·6	15·29	32·4	23·30	·5	...
Influenza	...	...	·3	...	...	...	4·7	...	...	...	2·2	...	1·9	...	·2	...	·2	...	2·0	...	·8	...	...	...	·5	...
Erysipelas	·7	...	1·3	...	1·8	...	...	...	1·1	...	1·7	...	2·1	·27	4·2	·22	2·9	·30	5·1	·28	·4	...	1·3	...	1·0	·48
Other Diseases of this Group ...	·7	...	·3	...	1·0	...	·8	...	·6	...	·5	...	2·1	...	·4	...	...	·30	·6	·28	1·9	·38	·6	...	...	...
Total	615·5	3·45	803·8	17·92	462·2	14·24	799·5	2·34	216·8	3·90	919·0	·55	844·4	24·03	279·2	12·77	770·9	32·68	473·2	9·06	1687·4	21·41	420·7	24·59	172·2	·96
Constitutional—																										
Rheumatism	45·6	...	56·3	...	48·2	...	46·8	...	52·4	...	84·8	...	68·3	...	51·1	...	39·5	...	56·9	...	27·2	...	77·7	...	39·3	...
Syphilis	87·4	·34	118·2	...	76·7	...	62·4	...	88·1	...	41·3	...	72·9	...	74·6	...	83·5	...	77·1	...	140·7	...	201·3	...	75·2	...
Scrofula, Phthisis, &c.	25·6	1·38	6·6	·94	9·0	·75	14·0	·78	5·6	...	9·9	·55	8·8	2·67	5·9	·88	11·9	1·48	11·9	·28	5·4	1·91	22·6	1·94	6·3	·48
Scurvy and Purpura	·3	...	...	...	...	...	·8	...	·5	...	·6	...	1·3	·27	...	...	·9	...	1·1	...	·4	...	...	...	...	...
Anæmia	2·1	...	3·5	...	5·5	·25	4·7	...	1·7	...	5·5	...	10·4	...	·9	·22	5·3	...	5·7	...	9·9	...	21·3	...	4·4	...
Other Diseases of this Group ...	·3	...	·9	...	·5	...	2·3	...	...	...	1·1	...	·6	...	·7	...	1·5	·30	·6	...	1·5	...	2·6	...	1·4	·48
Total	161·3	1·72	195·5	·94	139·9	1·00	131·0	·78	148·3	...	143·2	·55	162·3	2·94	133·2	1·10	142·6	1·78	153·3	·28	185·1	1·91	324·9	1·94	126·6	·96

General Diseases caused a higher ratio of admissions than during the preceding year in the Presidency, Allahabad, Oude, Meerut, Lahore, and Peshawur Divisions, and at the Depôts, and among the troops on the march; and a lower ratio in the Saugor, Rohilcund, Gwalior, Sirhind, and Rawul Pindee Divisions. The increase was considerable in the first four divisions, in all of which it took place chiefly in the febrile group of diseases, but very slight in the Peshawur Division, in which it was confined to the constitutional group. In all the divisions in which there was a reduction in the prevalence of general diseases it occurred chiefly in the febrile group; but the ratio of admissions for diseases of the constitutional group also was reduced in all the divisions except the Peshawur one. The highest ratio of admissions for diseases of the febrile group was furnished by the Peshawur Division, in which it was 1587·4 per 1,000 of the strength; and the lowest by the Rohilcund Division, in which it was 216·8 per 1,000 of the strength. For those of the constitutional group the highest ratio of admissions was furnished by the Allahabad and Peshawur Divisions, in each of which it slightly exceeded 185 per 1,000 of the strength, and the lowest by the Saugor Division in which it was 131·1. The ratio of mortality from diseases of the febrile group was reduced in the Saugor and Gwalior Divisions, and among the troops on the march; slightly increased in the Presidency Division, and greatly increased in all the others, and at the Depôts, the excess being due almost entirely to the epidemic of cholera. The ratio of mortality from diseases of the constitutional group was increased in the Presidency, Allahabad and Meerut Divisions, and troops on the march; the same as during the preceding year in the Gwalior Division; and reduced in all the others, and at the Depôts. It was everywhere moderate.

Eruptive Fevers were more prevalent and more fatal than during the preceding year, the increase in both respects being confined to small-pox, from which there were 25 admissions and 7 deaths; but they did not cause a serious amount of inefficiency in any of the divisions, the highest ratios of admissions for them being 4·2 per 1,000 of the strength in the Rawul Pindee Division, 2·4 in the Lahore Division, and 2·3 in the Saugor Division. In all the others except Oude, the ratio was below 1 per 1,000 of the strength. The highest ratio of deaths from them was ·85 per 1,000 of the strength in the Rawul Pindee Division. Of the 7 deaths from small-pox, 2 occurred at Dinapore, in the 96th Regiment, in two cases treated; 2 at Rawul Pindee, in the 36th and 70th Regiments, in four cases treated; and 1 at each of the following stations, the fatal case being in every instance the only one treated in the corps or battery to which the man belonged: Jullundur, in the 54th Fort; Attock, in No. 6 Battery, 24th Brigade, Royal Artillery; Peshawur, in No. 3 Battery, of the same brigade, Royal Artillery. The regimental reports contain no explanation of the unusual proportion borne by the deaths to the admissions, beyond the statement that the disease in the fatal cases was of unusual malignancy, and as to more than half of them no information is given as to the presence or absence of marks of vaccination. The fatal cases of scarlet fever occurred in the 4th Hussars, at Meerut.

Continued Fevers were greatly more prevalent than during the preceding year in the Presidency, Allahabad, Oude, Saugor, Meerut, Sirhind, and Rawul Pindee Divisions; slightly more prevalent in the Gwalior and Lahore Divisions; and less prevalent in the Rohilcund and Peshawur Divisions, among the troops on the march, and at the Depôts. The ratio of mortality from them was increased in the Rohilcund, Sirhind, Lahore, and Rawul Pindee Divisions, but reduced in all the others, and among the troops on the march. At the Depôts there were no deaths from them either in 1871 or 1872. The highest ratio of admissions was furnished by the Allahabad Division, in which it amounted to 559·1 per 1,000 of the strength, and the lowest by the Rohilcund Division, in which it was 41·2. The ratio of mortality was highest in the Rawul Pindee Division, in which it amounted to 3·40 per 1,000 of the strength, and lowest in the Saugor and Gwalior Divisions, in which there were no deaths from continued fevers. In the Presidency, Allahabad, Oude, and Meerut Divisions, in which the increase in the ratio of admissions was greatest, it was due in a great measure to the prevalence of the epidemic of dengue, by which, as has been mentioned, 4,026 admissions were caused

Bengal. among the men in the Command. The admissions for this disease among the officers were 148, among the women 346, and among the children 410. The ratios per 1,000 of the mean strength of the several classes, represented by these numbers, are as follows:—Officers, 103·6; men, 109·3; women, 90·1; children, 62·2. As in Madras and Bombay, however, many of the two last classes were no doubt treated in their quarters, and so escaped being included in the returns. There were no deaths from the disease in any of the classes.

Only 3,990 of the admissions are included in the Quarterly Returns furnished by the Principal Medical Officer, and they are distributed as follows between the several quarters:—

	Admissions.
Ist Quarter	7
IInd „	587
IIIrd „	1,779
IVth „	1,617

All the admissions during the Ist Quarter took place in the Presidency Division, and in it the disease reached its maximum of prevalence in the IInd Quarter, and disappeared during the IIIrd Quarter.

In the Allahabad Division, which is continuous with the Presidency one, the disease made its appearance in the IInd Quarter, during which eight cases occurred at Benares, and three at Dinapore, and it attained its maximum of prevalence in the IIIrd Quarter, and declined during the IVth Quarter.

In the Oude and Meerut Divisions, which adjoin the Allahabad one on the east and north, it did not appear until the IIIrd Quarter, and did not attain its maximum of prevalence until the IVth Quarter. The remaining divisions escaped altogether up to the end of the year, except the Sirhind one, in which there were 24 admissions (at Umballa) in the last quarter.

In almost every report received the extreme contagiousness of the disease is dwelt on, and that the course of the epidemic, as above described, was the result of its having been spread by contagion seems to be beyond doubt. It is said to have appeared in Calcutta in November 1871, among the Jewish community in the poorest and most densely populated quarter of the city, and as it had before that date been introduced into Bombay from Aden, between which city and Calcutta the communication both by rail and by steamer is now constant, the source from which the contagion was conveyed to the latter is not very obscure. The European community in Calcutta was not attacked by it till March 1872, but by the end of August from 60 to 70 per cent. of that community are said to have suffered from the disease. The date of the first case among the troops in Fort William is not mentioned in any of the reports. It appears, however, to have been in the end of March, and in April the epidemic had extended to Barrackpore and Dum-Dum.

The following Table shows the admissions for dengue in each quarter of the year in the several military divisions, and at the particular stations at which it appeared:—

Divisions.	Stations.	Admitted for Dengue in 1872.*				
		1st Quarter.	2nd Quarter.	3rd Quarter.	4th Quarter.	Total.
Presidency ..	Calcutta ..	7	151	86	..	244
	Dum-Dum ..	..	190	6	..	196
	Barrackpore ..	..	235	5	..	240
	Total ..	7	576	97	..	680
Allahabad ..	Allahabad ..	..	..	222	31	253
	Benares ..	..	8	65	14	87
	Cawnpore ..	..	..	372	249	621
	Dinapore ..	..	3	412	20	435
	Chunar	..	..	2	..	2
	Total ..	..	11	1,073	314	1,398
Oude ..	Lucknow ..	..	..	220	610	830
	Fyzabad ..	..	..	..	163	163
	Total ..	..	..	220	773	993
Meerut ..	Agra	..	..	182	195	377
	Meerut	..	..	52	121	173
	Delhi	..	..	140	16	156
	Muttra	..	..	15	154	169
	Total ..	..	..	389	486	875
Sirhind ..	Umballa ..	..	..	..	24	24
	Total ..	..	..	..	24	24
Troops on the march		..	..	..	20	20
Total in the Command		7	587	1,779	1,617	3,990

* Compiled from Quarterly Returns.

Enteric Fever.—With the single exception of cholera, this form of fever was the most fatal disease of the group, the deaths from it having amounted to 51, being three in excess of the highest number recorded during any of the previous 10 years. The admissions for it were only 104, being 27 fewer than those in 1871, but the prevalence of this disease in India is best judged of from the number of deaths caused by it, as the difficulties of diagnosis between the slighter cases of it and simple or malarious fevers attended with gastric irritability and intestinal disturbance are there so great that a considerable proportion of the former always escape recognition. The apparently much more fatal character of enteric fever in India than in Europe is no doubt attributable in a great measure to this cause.

The following Table shows the admissions and deaths from it in the Bengal Command recorded during each of the last 11 years:—

Bengal.

Year.	Enteric Fever.		Year.	Enteric Fever.	
	Admissions.	Deaths.		Admissions.	Deaths.
1862.. ..	10	6	1868.. ..	70	40
1863.. ..	20	13	1869.. ..	61	27
1864.. ..	9	5	1870.. ..	89	38
1865.. ..	13	8	1871.. ..	131	48
1866.. ..	14	9	1872.. ..	104	51
1867.. ..	16	8			

The increasing prevalence and fatality of the disease shown by this table are believed by some Medical Officers to be more apparent than real, and to be due in a great measure to increased accuracy of diagnosis, many cases being recognized now which in former years would have escaped recognition and been returned under other heads. It is certain that something must be attributed to this cause, but there is a very general opinion that enteric fever is becoming a more common disease in India, and the increase has been attributed to the repeated importation of its "contagium" from Europe within the last few years, for which the new system of transport, and the vast increase in the amount of communication by steamers since the opening of the Suez Canal, afford greatly increased facilities. The statistics of 1872, however, afford no confirmation at all of the latter views. No information of value with reference to the reality or otherwise of the increase of enteric fever can be obtained from a comparison of the total mortality from fevers now and that at former periods, as, owing to the great sanitary improvements effected of late years, the conditions are no longer the same.

The first of the following Tables shows the military divisions, and the particular stations at which, and the quarters of the year during which, the admissions for enteric fever took place.

The second shows the months during which, and the stations at which, the deaths from it took place.

The third shows the ages of the men who died from it, arranged in quinquennial periods, and the proportion of deaths from it per 1,000 of the strength at each period.

The fourth shows the periods of Indian service of the regiments and batteries of Artillery in which the deaths took place, and the proportion of deaths per 1,000 of the strength at each period of Indian service:—

Divisions.	Stations.	Admissions for Enteric Fever in 1872.				
		1st Quarter.	2nd Quarter.	3rd Quarter.	4th Quarter.	Total.
Presidency ..	Calcutta ..	1	1	..	..	2
	Hazareebaugh ..	..	6	1	..	7
	Total ..	1	7	1	..	9
Allahabad ..	Allahabad ..	3	..	..	..	3
	Cawnpore ..	..	1	1	1	3
	Dinapore ..	..	..	2	..	2
	Total ..	3	1	3	1	8

Divisions.	Stations.	Admissions for Enteric Fever in 1872.				
		1st Quarter.	2nd Quarter.	3rd Quarter.	4th Quarter.	Total.
Oude ..	Lucknow ..	2	2	2	2	8
	Fyzabad ..	2	..	..	1	3
	Seetapore ..	..	..	2	..	2
	Total ..	4	2	4	3	13
Rohilcund ..	Bareilly	..	..	1	..	1
	Raneekhet ..	..	..	2	2	4
	Total ..	..	..	3	2	5
Gwalior ..	Fort Gwalior ..	..	..	1	..	1
Meerut ..	Agra	1	1	..	..	2
	Meerut	..	3	3	1	7
	Delhi	..	..	..	1	1
	Muttra	..	..	1	2	3
	Total ..	1	4	4	4	13
Sirhind ..	Jullundur ..	..	1	5	1	7
	Subathoo ..	..	1	1	..	2
	Umballa ..	..	..	3	2	5
	Dugshaie ..	..	..	1	..	1
	Total ..	..	2	10	3	15
Lahore ..	Meean Meer ..	..	6	1	..	7
	Mooltan ..	..	1	..	..	1
	Govindghur ..	..	..	..	1	1
	Ferozepore ..	1	..	..	1	2
	Total ..	1	7	1	2	11
Rawul Pindee	Attock	1	..	..	..	1
	Rawul Pindee ..	4	3	4	..	11
	Chyragully ..	..	1	..	..	1
	Sealkote ..	..	..	1	1	2
	Total ..	5	4	5	1	15
Peshawur ..	Peshawur ..	..	2	1	..	3
	Nowshera ..	..	1	1	..	2
	Cheratt	..	4	1	..	5
	Total ..	..	7	3	..	10
	Total in the Command ..	15	34	35	16	100*

* This Table has been compiled from the Quarterly Returns for the Command, in which only 100 admissions for enteric fever are shown.

Benga'. RETURN of the number of Deaths from Enteric Fever during each Month of the Year, showing the Stations at which they occurred.

Month.	Total Number of deaths from Enteric Fever.	Stations at which deaths occurred, and number at each.	Month.	Total Number of deaths from Enteric Fever.	Stations at which deaths occurred, and number at each.
January ..	4	1 Allahabad. 1 Lucknow. 1 Ferozepore. 1 Rawul Pindee.	July ..	7	1 Raneekhet. 1 Dugshaie. 1 Meean Meer. 2 Rawul Pindee. 1 Peshawur. 1 Cheratt.
February ..	1	1 Allahabad.			
March ..	1	1 Fyzabad.	August ..	7	1 Lucknow. 1 Seetapore. 1 Raneekhet. 1 Muttra. 1 Umballa. 1 Jullundur. 1 Nowshera.
April ..	2	1 Agra. 1 Hazareebaugh.			
May ..	9	1 Hazareebaugh. 1 Cawnpore. 1 Lucknow. 1 Jullundur. 2 Meean Meer. 1 Lahore. 1 Rawul Pindee. 1 Cheratt.	September	9	3 Meerut. 2 Umballa. 3 Jullundur. 1 Subathoo.
			October ..	3	2 Raneekhet. 1 Muttra.
June ..	7	1 Delhi. 1 Meean Meer. 2 Rawul Pindee. 1 Peshawur. 1 Nowshera. 1 Cheratt.	November	1	[illegible]alkote.
			December		

DEATHS from Enteric Fever.

	Under 20.	20 and under 25.	25 and under 30.	30 and under 35.	35 and under 40.	40 and upwards.
Number	4	23	16	7	1	..
Ratio of deaths per 1,000 of strength ..	4·21	4·49	3·68	1·76	·64	..

The ratio of mortality under 30 was 4·13 per 1,000 of the strength; above 30 it was only 1·38 per 1,000 of the strength.

		Ratio of Deaths from Enteric Fever per 1,000 of Mean Annual Strength in 1872.
In 1st year of service in India	1 Battery of Artillery and 1 Regiment	7·06
2nd „ „ ..	4 Regiments	3·02
3rd „ „ ..	1 Regiment	2·18
4th „ „ ..	2 Regiments	1·29
5th „ „ ..	3 „	2·09
6th „ „ ..	4 „	4·87
7th „ „ ..	1 Regiment	1·16
8th „ „ ..	1 Batt. R.H.A. and 1 Regt.	2·79
Beyond 8th year of service in India.	1 Batt. R.H.A., 2 Batts. R.A., and 3 Regts. ..	3·08

The ratios in the last table do not seem very fully to bear out the generally received opinion that enteric fever prevails most in newly arrived regiments; but, as was mentioned in the report for 1871, the results shown by them are rendered unreliable by the great changes annually produced in the constitution of all regiments in India by invaliding, and the arrival of drafts of recruits from England.

In illustration of the disturbing effects, of these changes on the ratios of mortality at particular periods of the Indian service of regiments, it may be mentioned that the ages of the 11 men who died in regiments in the 6th year of their Indian service, giving the high ratio of 4·87 per 1,000 of the strength at that period were as follows :—

Completed Years of Age.	Number.	Completed Years of Age.	Number.
19	2	25	2
21	2	27	1
23	1	32	1
24	1	33	1

The majority, it is obvious, must have been sent out long after the arrival of their regiments in India.

The general results shown by the preceding tables may be briefly summarized as follows :—

1st. That 69 per cent. of the attacks took place during the two middle quarters of the year, the number in each being almost the same, and that the remaining 31 per cent. were divided almost equally between the first and last quarters.

2nd. That the period during which the mortality was greatest was that from May to September inclusive, the first month of that period during which the subsoil water was at its lowest level, and the last during which it was a little below its highest level, being those during which the number of deaths was greatest.

3rd. That the proportion of deaths to the strength was almost exactly three times greater below the age of 30 than above that age.

4th. That as a rule the proportion of deaths was greatest among men of very short Indian service.

5th. That the disease extended over the whole Command from Calcutta to Peshawur, affecting more or less a large number of stations, differing much as to elevation above sea level, rainfall, climate, soil, and sanitary conditions, but that it nowhere prevailed to a very serious extent, or caused a very high rate of mortality.

That enteric fever in India, as in other parts of the world, is a disease affecting chiefly the young, and from which strangers visiting an infected locality are much more liable to suffer than the permanent inhabitants of that locality, may be considered to be beyond doubt, and, this being so, that a newly arrived regiment containing a large proportion of young and immature men, if sent to a station where that disease is known to exist, should suffer from it in a much higher ratio than the acclimatized corps, consisting of older men, which preceded it had done, is only what might *a priori* be expected. That something more than heat and moisture is necessary for its production is obvious from the exemption enjoyed by some young regiments at stations where both are experienced in abundance; but, although the subject has received careful consideration from several officers, and several hypotheses have been suggested in explanation of it, no facts of interest bearing on the question as to the invariable transmission of the "contagium" from case to case, or the occasional production *de novo* as a result of putrescence of the specific poison which causes the disease, are brought forward in any of the reports.

Simple Continued Fever was rather less prevalent than during the pre-

Bengal. ceding year, and considerably less fatal, the deaths from it having amounted only to 13. Of these three took place in the 5th Lancers at Sealkote; two in the 62nd Regiment, at Lucknow; and one in each of the following corps, 4th Hussars, at Meerut; Royal Artillery, at Meean Meer; Royal Artillery, at Dinapore; 1st Battalion, 3rd Regiment, at Seetapore; 2nd Battalion, 12th Regiment, at Subathoo; 1st Battalion, 17th Regiment, at Lucknow; 63rd Regiment, at Hazareebaugh; and 70th Regiment, at Rawul Pindee. With the exception of a few cases reported to have been complicated with enteric symptoms, and of which some were no doubt mild cases of enteric fever, the majority of those admitted under this head appear to have been cases of ardent fever, attributable for the most part to the heat of the climate, and generally of short duration.

Cerebro-Spinal Fever caused 21 admissions and six deaths, of which 18 admissions and three deaths were in the 4th Hussars, at Meerut, and one admission and one death in each of the following corps:—Royal Horse Artillery, at Rawul Pindee: 2nd Battalion, 1st Foot, at Raneekhet; and 1st Battalion 14th Fort, at Calcutta. The period during which the disease prevailed in the 4th Hussars was from the middle of August to the end of October, which corresponds with the usual period of greatest prevalence of malarious fevers. No information as to the circumstances under which the disease originated is given in the regimental report.

Paroxysmal Fevers caused a higher ratio of admissions than during the preceding year in the Presidency, Meerut, Lahore, and Peshawur Divisions, and a lower one in the Allahabad, Oude, Saugor, Rohilcund, Gwalior, Sirhind, and Rawul Pindee Divisions, and at the Depôts, and among the troops on the march. The mortality from them was increased in the Presidency, Allahabad, Rohilcund, Sirhind, and Rawul Pindee Divisions, and reduced in all the others, and at the Depôts, and among the troops on the march. The ratio of admissions was highest in the Peshawur Divisions, in which it was 1380·1 per 1,000 of the strength, and next to it in the Gwalior Division, in which it was 859, having fallen to that from 1424·9 in 1871. It was lowest in the Oude Division in which it only amounted to 80·4. The particular corps in which, the excess occurred in the Peshawur Division were mentioned in the remarks on that station. The ratio of mortality also was highest in the Peshawur Division, but it only amounted to 2·68 per 1,000 of the strength, being lower by 3·63 than in 1871.

Malignant Cholera.—The regiments and stations which suffered most severely from this disease, and the period during which the epidemic prevailed have been already mentioned. All the divisions suffered more or less from the disease, but it did not prevail in an epidemic form in the Presidency, Saugor, Rohilcund and Gwalior Divisions, there having been but three admissions for it in the first, two in the second, and one in each of the others. On all the others it fell heavily, causing a much higher ratio of mortality than during the preceding year.

Arranged in the order in which they suffered from it the Divisions stand as follows:—

Division.	Ratio per 1,000 of Strength.	
	Admitted.	Died.
Lahore	44·6	28·82
Meerut	25·1	19·22
Allahabad	22·7	14·46
Peshawur	20·6	15·29
Oude	18·2	11·49
Sirhind	11·9	8·15
Rawul Pindee ..	7·4	2·55
Depôts	32·4	23·30

Rheumatism was more prevalent than during the preceding year in the Presidency, Allahabad, Oude, Gwalior and Meerut Divisions, and less so in all the others. In the force general its prevalence was slightly reduced, and it did not cause a serious amount of inefficiency in any particular corps.

Syphilis.—The ratio of admissions for this disease was higher than during the preceding year by 54·8 per 1,000 of the strength in the Peshawur Division, and by 13·7 in the Sirhind and in the Lahore Division, but lower in all the other divisions, the result for the whole Command being, as has been mentioned, a reduction of 14 per 1,000 of the strength. The highest ratio was furnished by the Peshawur Division, in which it amounted to 140·7, and the lowest by the Gwalior Division, in which it was only 41·3. The excess in the former was due chiefly to the number of cases in the 1st Battalion of the 6th Regiment, at Peshawur, in which the ratio of admissions for this disease was 201·8 per 1,000 of the strength, and the 2nd Battalion, 60th Rifles, at Nowshera, where it was 138; while in the 55th Regiment, at the former station, it was only 67. The ratio for the Command was 85·2.

Scrofula and Phthisis caused a higher ratio of admissions than in 1871 in the Presidency, Allahabad, Oude, Saugor, Gwalior and Rawul Pindee Divisions, and a lower one in all the others. Among the troops on the march and at the Depôts there was little change. The highest ratio was furnished by the Presidency Division, in which it was 25·6, and the lowest by the Peshawur Division, in which it was 5·4. In the former the great majority of the cases occurred in the 1st Battalion of the 14th Regiment, at Fort William, and the 107th Regiment, at Dum-Dum. The ratio of mortality from these diseases was higher than during the preceding year in the Allahabad and Meerut Divisions; almost the same as during the preceding year in the Presidency and Gwalior Divisions, and lower in all the others. The highest ratio of mortality was furnished by the Meerut Division, in which it was was 2·67 per 1,000 of the strength. In the Rohilcund Division there were no deaths from phthisis.

Anæmia.—The admissions under this head were in a lower ratio than during the preceding year in all except the Presidency, Lahore, Peshawur, and Gwalior Divisions, and, except in the Meerut Division, they nowhere amounted to one per cent. of the strength.

Local Diseases.—*Diseases of the nervous system* were more prevalent than in 1871 in the Presidency, Allahabad, Oude, Rohilcund, Gwalior, Meerut, Lahore, Rawul Pindee, and the Peshawur Divisions, and less so in the Saugor and Sirhind Divisions, at the Depôts, and among the troops on the march. The increase was greater in the Presidency and Allahabad Divisions, in which also the ratio of admissions was highest,—in each 32·1 per 1,000 of the strength. It was lowest in the Oude Division, in which it was only 11·7 per 1,000 of the strength. The mortality from this order of diseases was reduced in the Peshawur Division, and at the Depôts, but increased in all the other divisions, and among the troops on the march. The highest ratio of mortality was furnished by the Lahore Division, in which it was 4·45 per 1,000 of the strength, and the lowest by the Sirhind Division, in which it was 1·32. The most fatal disease of the order was sunstroke, from which there were 13 deaths in the Lahore Division, eight in the Allahabad Division, seven in the Meerut Division, three each in the Gwalior, Sirhind and Rawul Pindee Divisions, two in the Peshawur Division, and one each in the other divisions, and among the troops on the march. From apoplexy, which was the next most fatal disease, there were five deaths in the Oude Division; three in the Allahabad Division; two each in the Presidency, Meerut, Lahore and Rawul Pindee Divisions; one in the Peshawur Division; and one at the Depôts.

Diseases of the Eyes were more prevalent than during the preceding year in the Presidency, Allahabad, Oude, Sirhind, Lahore, and Peshawur Divisions, and at the Depôts, and less so in all the others, except the Meerut Division, in which there was no change, and among the troops on the march. The highest ratio of admissions for them was furnished by the Allahabad Division, in which it was 40·9 per 1,000 of the strength, and the lowest by the Saugor Division, in which it was 11·7. Of the 904 admissions recorded, 733 were for conjunctivitis, and most of the attacks appear to have been slight.

Diseases of the Circulatory System caused a higher ratio of admissions than

Bengal. in 1871 in the Presidency, Oude, Rohilcund, Sirhind, Lahore, and Rawul Pindee Divisions, and a lower ratio in all the other divisions, and at the Depôts, and among the troops on the march. The mortality from them was increased in the Oude, Saugor, Lahore, and Rawul Pindee Divisions, and among the troops on the march, and lower in all the other divisions and at the Depots. The highest ratio, both of admissions and of deaths, was furnished by the Lahore Division; and the lowest ratio of admissions by the Saugor Division. In the Allahabad and Rohilcund Divisions there were no deaths from this order of diseases. From aneurism of the aorta, which was the most fatal disease of the order, there were four deaths in the Oude Division; three each in the Presidency and Lahore Divisions; two each in the Gwalior, Meerut, Sirhind and Rawul Pindee Divisions; and one each in the Saugor and Peshawur Divisions, at the Depots, and on the march. From valve disease of the heart, the next most fatal disease, there were five deaths in the Lahore Division; three in the Rawul Pindee Division; two in the Meerut Division and one each in the Oude and Peshawur Divisions.

Diseases of the Respiratory System caused a higher ratio of admissions than in 1871 in the Presidency, Allahabad, Oude, Lahore and Rawul Pindee Divisions and at the Depôts; and a lower one in all the other divisions, and among troops on the march. The mortality from them was increased in the Oude, Rohilcund, Gwalior and Meerut Divisions; almost the same as during the preceding year in the Presidency and Lahore Divisions; and reduced in all the others, and at the Depots, and among the troops on the march. Omitting the Depots, the highest ratios of admissions and deaths were furnished by the Meerut Division, in which they were respectively 84·9, and 2·67; and the lowest ratio of admissions by the Oude Division, in which it was 32·7. In the Saugor Division there were no deaths from this order of diseases. Bronchitis was greatly the most prevalent disease of the order, upwards of 77 per cent. of the admissions having been caused by it, and pneumonia was greatly the most fatal one, 34 of the 49 deaths having resulted from it. Of these eight occurred in the Meerut Division; five in the Rawul Pindee Division; four at the Depots; three each in the Rohilcund, Sirhind, and Lahore Divisions; and one each in the Presidency, Allahabad, Oude, and Peshawur Divisions. The high ratios in the Meerut Division were due chiefly to the prevalence of diseases of this order in the 4th Hussars, at Meerut, in which regiment, in an average strength of 442 men, there were 74 admissions for bronchitis, 69 for pneumonia, 19 for pleurisy, and three for laryngitis, with four deaths, three of them from pneumonia and one from laryngitis.

Diseases of the Digestive System.—From this important order the admissions were in a considerably higher ratio than during the preceding year in the Allahabad, Oude, Lahore, and Rawul Pindee Divisions; in a slightly higher ratio in the Saugor, Sirhind, and Peshawur Divisions, and at the Depots; and in a lower ratio in all the other divisions, and among the troops on the march. The ratio of mortality from it was higher than in 1871 in the Oude, Rohilcund, Meerut, Sirhind, Lahore, Rawul Pindee, and Peshawur Divisions, and at the Depots, and lower in all the other divisions, and among the troops on the march. Omitting the Depots, the highest ratio of admissions was furnished by the Allahabad Division, in which it amounted to 345·9 per 1,000 of the strength, and the lowest by the Saugor Division, in which it was 188·8. The highest ratio of deaths was 7·80 per 1,000 of the strength in the Rohilcund Division, and the lowest was 3·06 in the Peshawur Division. As is usual, the admissions under this order were caused chiefly by diarrhœa, dysentery, hepatitis, and dyspepsia, and the deaths from it by the first three of these diseases. Their prevalence and the mortality caused by each of the several divisions are shown in the following Table, compiled from the Quarterly Returns. The statistics of dispepsia have been kept separate from the others, as the cases admitted under that head are for the most part the result of intemperance. With hepatitis are included all cases of abscess of the liver, whether associated with dysentery or not, as in the large number of cases reported as having been so associated (45, of which 43 proved fatal) there are no means of ascertaining which was the primary disease:—

Ratio per 1,000 of the Strength.

Divisions.	Presidency.		Allahabad.		Oude.		Saugor.		Rohilcund.		Gwalior.		Meerut.		Sirhind.		Lahore.		Rawul Pindee.		Peshawur.		Depôts.		Troops on the March.	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Diarrhœa	52·8	·35	91·8	·63	78·9	...	19·5	...	92·5	1·67	48·5	...	82·2	·53	78·6	...	96·5	·89	63·2	...	82·6	·38	172·2	...	44·6	...
Dysentery	51·1	·35	52·5	2·20	31·7	·75	34·3	·78	37·9	5·57	16·0	...	45·6	2·40	18·3	1·76	45·2	1·46	23·8	·57	38·2	·76	30·4	1·94	27·6	...
Hepatitis and abscess of the Liver	89·5	3·45	72·4	2·83	40·3	3·00	53·9	3·90	36·3	·56	30·2	3·30	49·9	3·20	35·9	1·98	45·2	3·27	61·5	2·27	57·7	1·91	136·6	7·77	22·8	·48
Total	193·4	4·15	216·7	5·66	150·9	3·75	107·7	4·68	166·7	7·80	94·7	3·30	177·7	6·13	132·8	3·74	186·9	5·62	148·5	2·84	178·5	3·05	339·2	9·71	95·0	·48
Dyspepsia	52·8	...	49·7	...	28·2	...	33·5	...	25·6	...	38·5	...	51·0	...	24·9	...	46·0	...	45·6	...	36·7	...	69·3	...	7·3	...

Bengal.

The comparative prevalence and fatality of dysentery, diarrhœa, and hepatitis during the several quarters of the year were as follows :—

	Hepatitis, including Abscess of the Liver, and Abscess of the Liver associated with Dysentery.				Dysentery.				Diarrhœa.				Total.*			
	Number.		Ratio per 1,000 of Strength.		Number.		Ratio per 1,000 of Strength.		Number.		Ratio per 1,000 of Strength.		Number.		Ratio per 1,000 of Strength.	
	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Ist Quarter ..	334	21	9·33	·59	172	4	4·81	·11	352	..	9·84	..	858	25	23·98	·71
IInd „ ..	510	14	13·77	·38	272	11	7·34	·30	580	3	15·66	·08	1,362	28	36·77	·76
IIIrd „ ..	587	30	16·10	·82	451	22	12·37	·60	1,334	7	36·60	·19	2,372	59	65·07	1·61
IVth „ ..	536	36	14·83	1·00	382	14	10·57	·39	561	2	15·52	·05	1,479	52	40·92	1·44

* No Annual Medical Report for the Command having been furnished by the Principal Medical Officer, this table has been compiled from the Quarterly Returns, in which 20 more admissions for these diseases (19 of them for hepatitis) are shown than in the Annual Return. The discrepancy is no doubt due to a correction made in the latter for cases in which the disease was changed erroneously returned as fresh admissions.

From this it appears:—1st. That while the third quarter was the one during which they all reached their maximum of prevalence, the difference between the ratio of admissions during it and the corresponding ratios for the second and fourth quarters was much greater in the cases of dysentery and diarrhœa than in that of hepatitis. 2nd. That dysentery and diarrhœa were nearly twice as fatal during the third quarter as during the second and fourth respectively, and more than five times as fatal as during the first. 3rd. That hepatitis was most fatal during the fourth quarter, and more fatal during the first than during the second. In judging of the effects of the climate at the different seasons on the mortality from these diseases, as shown by the number of deaths from them during the several quarters of the year, the more protracted course of hepatitis in many cases, and the frequent occurrence of abscess of the liver, as a sequel of dysentery, should however be borne in mind.

Diseases of the Urinary System were increased in prevalence in the Presidency, Oude, Rohilcund, Gwalior, and Peshawur Divisions, and at the Depots, and reduced in all the other divisions and among the troops on the march; the result for the whole Command being a slight reduction. The highest ratio was furnished by the Allahabad Division, in which it was 149·1 per 1,000 of the strength, and the lowest by the Peshawur Division, in which it was 62·3. The great majority of the admissions (3,571 out of 3,715) were for gonorrhœa and its sequelæ. Of the six deaths returned under this order, three were from Bright's disease, one each at Roorkee, Rawul Pindee, and Landour; one from abscess of the prostate gland at Delhi; one from abscess of the kidney at Dinapore; and one from vesical calculus, at Cawnpore.

Diseases of the Cutaneous System were more prevalent than in 1871 in the Presidency, Oude, Gwalior, Lahore, and Rawul Pindee Divisions, and at the Depots, and less so in all the other divisions, and among the troops on the march, the ratio for the whole Command being almost identical with that for the preceding year. The great majority of the admissions were as usual for boils and ulcers. The highest ratio of admissions was furnished by the Presidency Division, in which it was 87 per 1,000 of the strength, and the lowest by the Saugor Division, in which it was 28·9.

Conditions, &c.—The ratio of admissions for debility was greatly increased in the Allahabad Division, in which it amounted to 34·9 per 1,000 of the strength, the excess being confined in a great measure to the 96th Regiment, at Dinapore. It was increased, but to a less degree also, in the Oude, Meerut, Lahore, Rawul Pindee, and Peshawur Divisions. At the Depots it was the same as during the preceding year, and in all the other divisions it was reduced. In the Presidency Division, in which it was the lowest, it was 10·7 per 1,000 of the strength.

Poisons.—The admissions under this head were in a higher ratio than in 1871 in the Allahabad, Rohilcund, Meerut, Sirhind, Lahore, and Peshawur Divisions, and in a lower one in all the others, and at the Depots, and among the troops on the march. The highest ratio was 7·3 per 1,000 of the strength in the Peshawur Division, and the lowest 2·0 in the Rawul Pindee one. With three exceptions (one of poisoning by copper, one of poisoning by lead, and one of "vegetable" poisoning, the particular vegetable not being specified, none of which proved fatal) all the admissions were for delirium tremens, or the effects of poisonous doses of alcohol; and from these together there were 10 deaths, of which four were in the Meerut Division (two in the Artillery, and one in the 105th Regiment, at Meerut, and one in the 1st Battalion, 5th Regiment, at Delhi); two in the Rawul Pindee Division (one in the Royal Horse Artillery, at Rawul Pindee, and one in the 58th Regiment at Sealkote); one in the Presidency Division, in the 107th Regiment, at Barrackpore; one in the Oude Division, in the 21st Hussars, at Lucknow; one in the Lahore Division, in the 37th Regiment, at Meean Meer; and one among the troops on the march, in the 105th Regiment.

The admissions and deaths in the several corps serving in the Bengal Command in 1871 were as follow:—

Bengal.

Regiments.	Average Strength for the Year.	Admitted into Hospital.	Deaths. In India.	Deaths. Of Invalids.	Deaths. Total.	Ratio per 1,000. Admitted.	Ratio per 1,000. Died.	Stations during the Year.
								Months.
CAVALRY.								
4th Hussars ..	442	657	27	..	27	1486·4	60·94	Delhi* 1 Meerut 10 On the march 1
5th Lancers ..	454	520	13	1	14	1145·3	30·84	Sealkote 12
11th Hussars ..	455	628	5	1	6	1380·2	13·19	Delhi* 1⅓ Muttra 9 On the march 1 Umballa ⅔
15th „ ..	48	46	1	..	1	958·3	20·83	On the march from Mhow 1⅓
20th „ ..	327	334	11	2	13	1021·4	39·75	On the march 1 Umballa 9 On the march ½ Embkd. for England.
21st „ ..	433	872	9	..	9	2013·8	20·78	Lucknow 12
Total Cavalry..	2,159	3,057	66	4	70	1415·9	32·42	
ROYAL HORSE ARTILLERY.								Batt. Months.
A Brigade R.H.A.	760	1,690	26	..	26	2223·6	34·21	A, Peshawur ½ „ On the march 1 Meean Meer† 10½ B, Rawul Pindee 11⅔ „ On the march* ⅓ C, On the march ⅓ „ Peshawur 11⅔ D, Campbellpore* 12 E, Sealkote 10 „ On the march 2
D Brigade R.H.A.	131	282	9	..	9	2152·6	68·70	D, Delhi* 1⅓ Meerut† 8⅔ On march, to embark for England ½
F Brigade R.H.A.	761	1,460	31	..	31	1918·5	40·73	A, Benares 1 „ On the march 1 „ Lucknow† 10 B, Morar 10 „ On the march 2 C, Lucknow 1 „ On the march 1½ „ Umballa 9½ E, Delhi* 1 „ Meerut† 11 F, On the march 1 „ Umballa 11
ROYAL ARTILLERY.								
5th Brigade R.A.	84	79	..	..	..	940·5	..	No. 3, Darjeeling 12

* Signifies that a portion of the period was passed in the Camp of Exercise.
† Indicates that during a portion of the period the Corps was in Camp on account of Cholera.

Regiments.	Average Strength for the Year.	Admitted into Hospital.	Deaths.			Ratio per 1,000.		Stations during the Year.
			In India.	Of Invalids.	Total.	Admitted.	Died.	
RL. ARTILLERY, *continued.*								Batt.: Months.
8th Brigade R.A.	948	1,663	33	2	35	1754·2	36·92	A, (late F 20th Bde.) Peshawur 3 „ On the march* ½ B, Dinapore 12 C, Lucknow 12 D, Jubbulpore 1 „ On the march 1 „ Benares 10 E, Saugor 10⅔ „ On the march 1⅓ F, Barrackpore 12 G, Jullundur 11⅔ „ On the march & at Phillour ⅓ H, Meean Meer† 11⅓ „ On the march* ⅔
13th „ „	629	1,266	27	..	27	2012·7	42·92	No. 1, Rawul Pindee 4⅓ „ Murree 7⅔ „ On the march* ⅓ 2, Calcutta 12 3, Ferozepore 12 4, Ft. Govindghur. 12 5, Fort Attock 12 6, Delhi* 2⅔ „ Jutogh 9⅓ 7, Meean Meer† 12
16th „ „	1,005	1,493	21	3	24	1485·5	23·88	A, Seetapore 12 B, Barrackpore 12 C, Morar 12 D, Delhi* 1 „ On the march 2 „ Rawul Pindee 9 E, Fyzabad 12 F, Delhi* 1 „ Meerut 11 G, (formerly E Batt. 23rd Brigade) Bareilly 4
19th „ „	921	1,731	22	..	22	1879·4	23·89	A, Cawnpore 12 B, Ferozepore 12 C, Mooltan 12 D, Delhi* 1 „ Meerut† 9 „ On the march 2 E, Delhi* 1 „ On the march 1⅓ „ Allahabad 9⅔ F, Delhi* 1½ „ Agra 10½ G, (late F Batt. 23rd Brigade) Nowgong 4

* Signifies that a portion of the period was passed in the Camp of Exercise.

† Indicates that during a portion of the period the Corps was in Camp on account of Cholera.

Bengal.

Regiments.	Average Strength for the Year.	Admitted into Hospital.	Deaths. In India.	Deaths. Of Invalids.	Deaths. Total.	Ratio per 1,000. Admitted.	Ratio per 1,000. Died.	Stations during the Year.
RL. ARTILLERY—*continued.*								Batt. Months.
20th Brigade R.A.	129	155	..	..	..	1201·5	..	F, Peshawur 8⅓ transferred to 8th Bde. as A Batt.
22nd „ „	12	1	..	..	..	83·3	..	No. 2, Rawul Pindee ⅔ „ On the march 1⅓ Embked. for England.
23rd „ „ (late 24th)	677	1,059	15	2	17	1564·2	25·11	No. 1, Morar 12 2, Gwalior 1 „ On the march ⅓ „ Delhi 10⅔ 3, Peshawur 11½ „ On the march* ½ 4, On the march 1 „ Ftress. Gwalior 11 5, Agra 12 6, On the march 1 „ Lucknow 11 7, Allahabad 12 E, Bareilly 8 transferred to 16th Bde. as G Batt. F, Nowgong 8 transferred to 19th Bde. as G Batt.
Total Rl. Artillery	6,057	10,879	184	7	191	1796·1	31·53	
INFANTRY.								Months.
1st Foot, 2nd Bn.	423	390	10	1	11	922·0	26·00	Shahjehanpore 12
„ L. Wing	474	571	18	..	18	1204·6	37·97	Raneekhet 12
3rd „ 1st Bn.	480	411	5	1	6	856·2	12·50	Seetapore 12
„ Half „	404	555	6	..	6	1373·7	14·85	Benares 12
5th „ 1st „	943	1,041	14	1	15	1103·9	15·91	On the march 1½ Bareilly, with Det. at Moradabad 10½
6th „ 1st „	882	1,510	43	1	44	1746·0	49·89	Peshawur† 12
8th „ 1st „	727	1,741	32	..	32	2394·7	44·02	From Bombay On the march ⅓ Cawnpore 10
11th „ 1st „	888	1,342	16	..	16	1511·2	18·02	Morar 12
12th „ 2nd „	913	778	8	..	8	852·1	8·76	Subathoo 10½ On the march ½ Ferozepore 1

* Signifies that a portion of the period was passed in the Camp of Exercise.
† Indicates that during a portion of the period the Corps was in Camp on account of Cholera.

Regiments.	Average Strength for the Year.	Admitted into Hospital.	Deaths.			Ratio per 1,000.		Stations during the Year.	Months.
			In India.	Of Invalids.	Total.	Admitted.	Died.		
INFANTRY—*cont.*									
14th Foot, 1st Bn.	852	1,538	13	..	13	1805·1	15·22	Calcutta With detachment at Cawnpore	12 2 1/3
17th „ 1st „	918	1,322	22	1	23	1440·0	25·05	Lucknow	12
19th „ 2nd „	825	1,326	40	3	43	1607·2	52·12	Allahabad†	12
25th „ 2nd „	910	988	9	..	9	1085·7	9·89	Saugor On the march Jubbulpore	2 1/2 1/2 9
26th „ ..	857	730	32	..	32	851·8	37·34	Fyzabad On the march	11 1
36th „ ..	913	702	17	1	18	768·9	19·71	Rawul Pindee, with detachment at Kalabagh	12
37th „ ..	849	1,893	84	3	87	2229·6	102·47	Meean Meer†	12
39th „ ..	935	920	7	..	7	983·9	7·49	Ferozepore On the march	11 1
40th „ ..	127	181	2	..	2	1425·1	15·75	Arr. from England On the march Lucknow	1/3 1 1/3
41st „ ..	879	1,358	20	2	22	1544·9	25·03	Mooltan, with detachment at Dera Ismail Khan	12
44th „ (Det.) ..	119	273	2	..	2	2294·1	16·81	On the march Puckmuree	1/3 9
51st „ ..	110	177	1	..	1	1609·0	9·09	Arr. from England On the march Fyzabad	1/2 1
54th „ ..	909	915	37	..	37	1066·6	40·70	Jullundur, with detachment	12
55th „ ..	880	2,424	36	..	36	2754·5	40·91	On the march Peshawur†	2/3 11 1/3
58th „ ..	851	1,403	14	..	14	1648·6	16·45	Sealkote	12
60th „ 2nd Bn.	1,064	2,190	15	1	16	2058·2	15·04	Peshawur Nowshera On the march*	1/2 11 1/2
62nd „ ..	827	725	13	..	13	876·7	15·72	Lucknow Dum Dum	10 1/2 1 1/2
63rd „ ..	919	1,027	6	..	6	1117·5	6·53	Hazareebaugh	12
65th „ ..	944	964	28	1	29	1021·1	30·72	Delhi* Agra	1 11
70th „ ..	879	1,263	26	..	26	1436·8	29·58	Rawul Pindee On the march*	11 2/3 1/3
72nd „ ..	901	1,201	25	..	25	1332·9	27·75	Delhi* Umballa	1/2 11 1/2
85th „ ..	935	765	27	1	28	818·2	29·95	Dugshaie, with det. at Umballa On the march Meerut, with det. at Futtyghur	10 1/3 1 2/3

* Signifies that a portion of the period was passed in the Camp of Exercise.
† Indicates that during a portion of the period the Corps was in Camp on account of Cholera.

Bengal.

Regiments.	Average Strength for the Year.	Admitted into Hospital.	Deaths. In India.	Deaths. Of Invalids.	Deaths. Total.	Ratio per 1,000. Admitted.	Ratio per 1,000. Died.	Stations during the Year.	Months.
INFANTRY—*cont.*									
92nd Foot ..	995	·467	10	..	10	469·3	10·05	Delhi*	1
								On the march	1
								Chuckratta	10
96th „ ..	825	1,481	20	4	24	1795·1	29·09	Dinapore	12
105th „ ..	618	1,191	46	2	48	1927·1	77·67	Delhi*	1
								Meerut,† with det. at Futtyghur	9½
								Embarked for England.	
106th „ ..	897	1,835	12	1	13	2045·7	14·49	Jhansi	12
107th „ ..	803	1,275	18	1	19	1587·7	23·66	Dum-Dum, with detach. at Barrackpore	10½
								On the march to Madras.	
109th „ Hd.-Qrs.	408	643	10	1	24	1575·9	28·37	Delhi*	1
								On the march	½
„ „ Det. ..	438	1,130	13			2479·9		Roorkee	10½
								Delhi*	12
Total Infantry.	28,521	40,676	757	26	783	1426·1	27·45		

* Signifies that a portion of the period was passed in the Camp of Exercise.
† Indicates that during a portion of the period the Corps was in Camp on account of Cholera.

As during the two preceding years, the ratio of admissions was highest in the Artillery, and lowest in the Cavalry; but that of deaths, which, in 1870 and 1871, was lowest in the Cavalry, was highest in that arm, and lowest in the Infantry.

In the Cavalry, greatly the highest ratio of admissions was furnished by the 21st Hussars, at Lucknow (the epidemic of dengue being the cause of the excess), and greatly the highest ratio of deaths by the 4th Hussars, at Meerut. Omitting the 15th Hussars which was only in the Command for a few weeks, the lowest ratio of admissions occurred in the 20th Hussars, at Umballa, and greatly the lowest ratio of deaths in the 11th Hussars, at Delhi.

In the Artillery the ratio of admissions was again the highest in the A Brigade, Royal Horse Artillery; the A Battery, at Meean Meer, and the C Battery, at Peshawur, being those in which the excess chiefly occurred. The ratio of deaths was highest in the D Battery, D Brigade, Royal Horse Artillery, at Meerut, seven of the nine deaths in that battery having, however, been the result of cholera. Omitting detachments of which the strength was less than 100 men, the lowest ratio of admissions was furnished by the portion of the 20th Brigade, Royal Artillery, at Peshawur, and the lowest ratio of deaths by the 16th Brigade, the batteries of which were distributed over the whole Command.

In the Infantry, the 55th Regiment, at Peshawur, furnished the highest ratio of admissions, and the 37th, at Meean Meer, the highest ratio of deaths. The lowest ratio of admissions occurred in the 92nd, at Chuckratta and Delhi, and the lowest ratio of deaths in the 63rd at Hazareebaugh.

SANITARY REPORT.

Inspector-General Beatson, C.B., Principal Medical Officer of the British Forces in India, reports that 389 deaths are recorded out of 592 admissions under the head of cholera. The disease showed itself at a few stations early in the spring; at Allahabad, for instance, the first case is recorded to have occurred on the 27th March, although it was later than this that the disease appeared at Allahabad in an epidemic form among the troops; at Benares there were four cases in April, of which three were fatal; and at Sealkote four cases and four deaths occurred towards the end of April. The appearance of cholera, however, at those stations in the Punjab which suffered most severely, was at a considerably later date. *Bengal.*

At Kussowlee, the first case among the troops occurred on the 5th of July; at Subathoo, 12th of July; at Dugshaie, 29th of July; at Fort Lahore, 16th of July; at Meean Meer, 1st of August; at Jullundur, 22nd of August; at Phillour, 23rd of August; at Umballa, 30th of August; at Rawul Pindee, 18th of July; at Murree, 18th of July; at Attock, 5th of October; at Peshawur, 10th of October.

It will be seen with regret how much the mortality was increased by the severe outbreaks of cholera, which, before the end of the rains, had become epidemic all over Northern India. The troops were moved into tents, and, I believe, every measure that could be judiciously taken was put in force to endeavour to stay the ravages of the disease.

In my remarks on the Sanitary Report for 1871, I expressed a hope that the new scale of hospital equipment, sanctioned by the Government of India in September of that year, would be shortly introduced. While on this subject of hospital equipment, I think it right to add that I have lately addressed a letter through the Quartermaster-General of the Army, for the consideration of his Excellency the Commander-in-Chief, and of the Government of India in the Military Department, regarding a recent decision of the Government of India to have boards and trestle bedsteads for general use in hospitals. On the occasion of a former reference to me, I agreed that owing to their portability, and at the same time strength, the above form of bedstead might be utilized for field hospitals; but the objections to making boards and trestles the standard pattern for stationary hospitals in cantonment are so many and so manifest, that I would regard the general use of such bedsteads in cantonment hospitals as little short of a calamity to the sick soldier. I trust, therefore, that the decision of the Government of India on this subject may be reconsidered and modified. Hospital Equipment.

In his report for 1870, my predecessor mentioned that during that year, 6,981 men, women and children, had been located in the hills; and at the same time expressed a hope that the numbers would ere long amount to 8,000. The accompanying table shows that 7,702 men were, on 30th May 1873, enjoying the advantage of residence in the cool climate of the hills, where, at same date, there were also 697 women and 1,247 children, making a grand total of 8,746. These numbers are not likely to be less in future years, unless under the pressure of circumstances which we cannot foresee. Troops in the Hills.

It is right, however, to mention that of the above numbers a good many, nearly all the men at Cherat, for instance, and a considerable number of the 60th Rifles at Chamiari (near Murree) are under canvas; this, however, as regards the 60th, is a temporary arrangement, until the new station for a regiment near Murree is completed.

Nor is it to be inferred that all these men, women, and children, are on the hills throughout the year; there is no object in their being so. Indeed if the well-being of the soldier, and his own feelings are to be considered, the men who have been during all the trying season of the year at the hills might, in my opinion, be brought with advantage (even to health) down to the plains, and put under canvas during the four colder months of the year; as by this means, if encamped near the head-quarters of their respective divisions, the men would have the advantage of brigade drill, instead of merely vegetating in the climate of the mountains; a few married men, with

Bengal. their families, would be all that would be required for the care of the barracks at the hill station.

This arrangement would no doubt involve a certain amount of transport, but, if men are to be in the hills, they should have at all times the means of moving in light marching order at the shortest notice, should their services be needed in the plains. Every one who saw the results of air and exercise on the men at the late camp of exercise in the Punjab, must be satisfied as to the benefit to health of active exercise in the open air; and so impressed am I with the importance of this in the cool season, that, in Northern India, I would wish to see railway travelling, as regards regiments moving in relief, entirely done away with, when time is not the most important consideration.

The European soldier in India leads, of necessity, for many months of the year, a very inactive life; but notwithstanding his inaction, he is eating and drinking much as he would at home; it is only therefore (as I have remarked in my report on the late camp of exercise) by a somewhat active life during the colder months, which in Northern India lasts from the middle of October to the middle of March, that the evils of continued inaction during the hot weather can be got rid of, and the physical condition of the men become developed.

Many men, who on arrival at the camp were easily tired and knocked up, could, by a few weeks training, work all day without discomfort or feeling of fatigue, while the appearance of all the men showed indications of improved health and of sound hard condition.

Ages of men sent to India. In the Abstract of the Seventh Annual Report of the Sanitary Commissioner with the Government of India, as given in the recent review of these reports by the Army Sanitary Commission, it is stated at lower part of pape 73, under heading "the mortality and invaliding among young men have been very high" that of European soldiers under 24 years of age, 1,307 had died, and 1,895 been invalided during the previous six years.

The report goes on to say that it cannot be shown how much of these results have been due to the youth of the recruits, and how much to their weakly physique; that in all probability both causes have had an important influence.

The report adds, "however this may be, there can be little doubt that the recent measures which have been adopted to prevent very young lads from coming to India will have a good effect." Army Sanitary Commission Report, 1872, page 73.

The accompanying return will show that in the several newly arrived regiments there were on arrival in India a large number of men under 22* years of age;—in the 51st, no fewer than 437, and in the 40th, 365;—and that of these lads, 330 are returned as weakly. If he be a strong and healthy lad, no one can object to a young man of 22 being sent to India; and if not strong and healthy, it signifies very little whether a man on arrival in this country be 22 or 25. But judging from returns which I have had sent to me, of the weight, &c., of some of the lads above referred to, I am inclined to doubt if their actual ages were really the ages given on enlistment; in fact the stated ages as *now* given, and the recorded ages, in many instances do not agree, in some cases by two years, and in others by one. This is quite explicable to any one who knows anything of recruiting in England.

Of the more weakly lads of the 40th and 51st, a good many are at Mynee Tal and Dugshai, in order that they may escape the deteriorating influence of residence in the plains during the hot weather; and it is gratifying to find, by returns from both stations, that with one or two exceptions (men quite unfit for the service) all the lads, sent to the above stations, have steadily and considerably increased in weight since their arrival.

This shows that there has been improvement, not deterioration, and by thus escaping the injurious effects of the climate of the plains at the commencement of their Indian career, we may be more hopeful of the future of these young men, although the Medical Officer in charge at Mynee Tal is of opinion that a good many of them will require a *second* season in the hills, before they can be considered equal to the trials of service in a tropical climate.

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* A certain proportion under 20 years—in 51st, 151, and in 40th, 73.

Bengal.

The Army Sanitary Commission have raised the question, how far it may be expedient (with our present knowledge of the effects of the Indian climate on young men newly arrived in India) to garrison this country with men enlisted for short service?

With all deference, I would venture to say, that I can see little practical use in raising any such question; as, whatever modifications experience may show to be necessary as regards the present regulations for enlistment, it is not to be supposed that the long service enlistment rules, as known in former days, will ever be reverted to. The spirit and the circumstances of the age are opposed to anything of the kind, independently of the fact that all experience proves that there is no such thing as acclimatization of Europeans in the plains of India, while statistics equally show that other conditions being equal, mortality does increase, and very markedly so, with length of tropical service.

Causes of increased mortality in Regiments newly arrived in India.

The real reason why regiments on arrival in this country suffer so much, I believe to be, that newly arrived regiments are as a rule more largely composed (in order to make up their required numbers prior to embarkation) of weakly, ungrown lads; secondly, there is doubtless a good deal of inexperience of Indian ways and requirements on the part of new arrivals; and thirdly, there is the fact, quite apart from the acclimatization theory, that new arrivals are, for the first year or two, more liable to attacks of acute tropical disease than they are at a later period; this results in some degree, but not altogether, from the fact that at first they do not realize that they cannot do in India as they have been accustomed to do at home.

The remedies for these conditions are, that young men, whether enlisted or not in England, should not be sent to India until they are well, that is fully grown, which they cannot be considered to be under 21, if not 22 years of age; and secondly, that, as far as practicable, all corps on arrival in India should have their first two years of service at the best stations available; *in the hills if possible.* Could these measures be carried out, I believe that with two years in the hills (that is the hot seasons of two years) at the commencement of their Indian service, and two more after four years residence in the plains, most regiments might put in ten years of Indian service with far less mortality and invaliding than take place under existing arrangements. The proposed system would involve at least one-third of the European force being in the hills, and I can see no reason why this should not, in peace times, be practicable. The European force in India is not considered a peace establishment, and if it is not, a large portion, certainly at least one-third, should be at any moment available for offensive operations in the field. When there are no such operations, why should not that portion of the force be in healthy localities?

As to the question of *enlistment* at a comparatively early age, it may be a more expensive process, as it involves keeping lads a longer period before they are really fit for effective soldiering, but I believe the result would be a better class of men; as it stands to reason that after enlistment, a lad would be better fed and better looked after in every way than the great majority of recruits ever are until they enter the service; while the lads training (provided they are neither *overworked* nor *overweighted*) would, with good and ample food, ensure a good physical development by the time they were 21 years of age; that is, provided they were enlisted with good constitutions, and free from physical infirmity of any kind.

Barracks, Hospitals, and General Sanitary condition of Stations.

During last winter, I had an opportunity of visiting almost every station in the Punjab, from Agra to Peshawur, including the hill stations of Murree, Nynee Tal, Raneekhet, Kussowlee, and Subathoo. The report of my inspections, as submitted to the Government of India and to his Excellency the Commander-in-Chief, shows that on the whole the "barracks and hospitals are in very good condition, that there is no overcrowding, and that with very rare and occasional exceptions, the rations of the men, and the diets for the sick in hospital were, and had been, very good; the only exceptions being that, in one or two instances, I found the mutton thinner than it ought to have been. This will always happen, until it is ruled that, during the very dry season when grass is scarce and stunted, the mutton for issues shall be grain fed for

Bengal.

a sufficient time to put on flesh; a week or ten days is of little use in this respect.

Bedding for Troops.

My predecessor, in his Sanitary Report for 1870, noticed the deficiency of barrack bedding at some of the colder stations in the winter months. Provision is now made for this important requirement being at all times met on the authority of the Officer Commanding the Station, and on the recommendation of the Senior Medical Authority on the spot.

Fresh Vegetables.

There is still some difficulty of keeping up a supply of good fresh potatoes far a month or two in each season, and this difficulty I fear will always be felt more or less; as, even in the localities (the hills) from whence the supplies are derived, good potatoes are not very easily procurable for a month or two during and towards the end of the rains.

As far as the health of the men is concerned, a small provision, in the way of preserved and compressed vegetables, would meet any difficulty which exists in supplying good wholesome potatoes, during the comparatively short period of the year when it is extremely difficult to get them of good quality, and, if not of good quality, they are worse than useless.

During this month (of July) a careful inspection of the men of 11th Hussars and 72nd Highlanders at Umballa disclosed some slight tendency to a scorbutic taint. This tendency, whenever apparent, it is of the utmost importance to counteract, as its presence is so apt to unfavorably influence the results of climatic disease.

Water Supply for Military Cantonments.

The water supply is a subject which I believe is now engaging the serious attention of Government, and a good deal has already been done; at Lucknow, for instance, all the wells, from which the European troops are supplied with water for drinking and cooking purposes, have been covered over and fitted with pumps and filter beds, the water being conveyed in tinned vessels to the Macnamara filters in barracks; as Government has, after a full experimental and satisfactory trial, sanctioned the issue of these useful and effective filters for all barracks and hospitals.

A very painstaking and careful enquiry has lately been made, by the Sanitary Commissioner for the Punjab, as to the water supply of the various hill stations; and it is to be hoped that Dr. De Kenzy's sensible suggestions will be well considered.

Dr. De Kenzy advocates (as I have always done) a full and early consideration of the water *storeage* question, a matter which I believe has too long escaped attention; this neglect leads, and has led, to much inconvenience from scarcity during that season when all the hill springs are much diminished, or (save the larger ones) entirely exhausted. On a full consideration of the subject of the epidemic visitation at Dugshai last season, Dr. De Kenzy is of opinion that there is no conclusive evidence to connect the presence of the disease with the water supply. Few people, however, who have paid much attention to the subject, can doubt the fact that water, polluted with cholera or typhoid fever germs, is one of the producing causes of these diseases; but I incline to the belief that these causes are more likely to come into operation in localities where sewers or sewer pipes are in close proximity, and from leakage defects, in actual communication with wells or other sources of water supply. But, under any conditions, sources of water supply, unless thoroughly protected, may become contaminated, provided the germs of the above diseases can, by percolation or by more direct means, find their way to the water used for household purposes.

It is on this account, among others, that I felt bound to dissent from the proposal lately made by the Sanitary Commissioner with the Government of India, in which he recommended the removal of all restrictions in the way of cordons during periods of epidemic disease, on the plea that the disease being an air-borne one, all such restrictions were useless.

But, as Mr. Simon remarks in one of his recent reports (and if it be not presumption in me to say so, I may observe that I most fully concur in the soundness of Mr. Simon's views on this subject), "if the presence of a single "case of cholera, perhaps of the slightest degree, and perhaps quite unsus- "pected in the neighbourhood, may, if local circumstances co-operate, "exercise a terribly infective power on considerable masses of population, "can we be too careful to guard against the mischief?"

What these local circumstances are, may be safely inferred from what Mr. Simon says in another place: "if any taint, however small, of the infected "matter gets access to wells or other sources of drinking water, it imparts to "enormous volumes of water the power of propagating the disease." *Bengal.*

There is practical common sense in this, and it leads to *practical* action; but, with the aerial theories, one may as well try to grasp the wind.

By the establishment of certain precautionary measures, preventing individuals from cholera-infected localities, and restraining bodies of men, women and children, among whom cholera exists, or has recently existed, from having free and unlimited access to non-infected localities, we at all events do all we can to protect, among other things, the water supply from becoming specifically infected; and to accomplish this, is at all events to do something towards the arrest of the disease.

His Excellency the Commander-in-Chief having supported this view of the subject, we may hope the present very excellent, but by no means harassing regulations, as to the protection of our cantonments in times of Cholera, will not be interfered with.

In advocating the expediency of the roof water tank system, Dr. De Kenzy instances its universal use in Corfu, and the marked immunity of that island from cholera.

Dr. De Kenzy may, no doubt, be speaking from more recent experience of Corfu than I have; but his remarks do not at all apply to the conditions of water supply to the town and citadel of Corfu during 1859 and 1860, at which period I was Principal Medical Officer in the Ionian Islands. At that time the town and citadel were supplied from the reservoir at Perama, eight miles distant from and above the town, the upper and lower districts of which were supplied by separate sets of pipes from the same source.

This arrangement certainly existed up till 1862 or 1863, as will be seen by a reference to the Report of the Barrack and Hospital Improvement Commission, from which report it will also be seen that the quality of the water was neither pure nor good; its worst quality being its excessive hardness.

The large and important subject of drainage, surface and subsoil, of our Military Cantonments, is, I believe, now engaging the attention of Government in the Military Department; but I am not aware to what extent any decision has yet been arrived at. *Drainage.*

There has been no reduction in the strength of the garrison of Peshawur, but this year, as last, a large number of the men composing the force at Peshawur and Nowshera have been located on the hill of Cherat; and within the last few weeks, 200 more men have, on the recommendation of his Excellency the Commander-in-Chief, been sent up there, making in all, at that convenient but limited locality, 896 men, 49 women, and 86 children. *Peshawur.*

In the former part of this report, I mentioned the absence of barrack or hospital buildings (save a few temporary huts) at Cherat. I am able now to say that a hospital building has been sanctioned, and will doubtless be available for occupation before the next hot weather. Thus one, and perhaps the most pressing, requirement will be met; others, I hope, will be also favourably considered and sanctioned; so that this healthy little spot, only 16 miles from Peshawur by a good road, may be utilized to the full.

On this subject I may refer to my predecessor's remarks on the Sanitary Report for 1870; these remarks are almost, if not quite, as applicable to 1872; but still there is room for hope, as there is an anxious desire on the part of both Civil and Military Authorities to make the application of existing acts as successful as possible; the counteracting difficulties have been mentioned by my predecessor. *Venereal.*

I will only touch on one more subject, and will quote the remarks made on the report of my recent inspections of Her Majesty's hospitals in the Punjab. *Hospital Servants.*

"On the subject of hospital servants as at present procurable, I can only say "they are in many instances as indifferent as they can be. At Peshawur, I "saw not only boys, but literally children, mustered as ward coolies; the Com-"missariat declaring their entire inability to procure any better hospital servants.

"The difficulty in this respect is increasing every day, and for it I believe "there is only one remedy, viz.:—to have an enlisted body of men as hospital "servants,—a Native Army Hospital Corps.

Bengal. "Until this fact is recognized, the administration of military hospitals in "this country will be imperfect; and in the hour of utmost need, there may "be no hospital attendance forthcoming.

"Six years ago, I submitted, at the request of Government, a scheme "for such a corps, but the matter has never apparently advanced further. "For my part, I regard it as a most vital element towards any real improve- "ment in hospital organization in India; while I am certain the establish- "ment of such a corps would not entail any large increase of expenditure, as "the improved quality in the personnel and training of the hospital attendants "would admit in a short time of a revision of present numbers."

TOTAL numbers of Men, Women and Children, of British Troops on the Hills on 30th May 1873.

Hill Stations.	Duty Men.	Convalescents.	Total Men.	Women.	Children.	Total Souls.	Remarks.
Darjeeling	82	119	201	19	34	254	2 | 5th Royal Artillery.
Nynee Tal	..	258	258	21	49	328	
Raneekhet	692	..	692	69	126	887	2 | 1st Regiment "Royal Scots."
Landour	..	211	211	23	67	301	
Chuckratta	887	..	887	76	151	1,114	92nd Regiment.
Kussowlee	..	441	441	94	205	740	
Dugshai	956*	99†	1,055	101	136	1,292	
Subathoo	875	..	875	90	173	1,138	1 | 11th Regt.
Jutogh	90	..	90	14	22	126	
Dalhousie	136‡	442	578	23	31	632	
Bhagsoo	120	..	120	..	..	120	
Murree Hills ..	1,016§	526	1,542	118	267	1,927	
Cherat	606‖	..	606	49	86	741	
Puchmurree (Madras troops)	..	146	146	..	..	146	
Totals ..	5,460	2,242	7,702	697	1,347	9,746	

NOTE.—200 more men sent to Cherat at the end of July or beginning of August.

* 37th Regiment.

† Detachments 40th and 51st Regiments.

‡ Detachment 1 \| 6th, at Bunnykhet.

§ Including 1 \| 13th R.A., Head Quarters 2 \| 60th Rifles at Camp Chamiari, and the three detachments at Kalabagh, Bara Gully, and Chungla Gully.

‖ Detachments R.A., 39th, 55th, and 58th Regiments.

Report on the Medical History of, and on the Medical and Sanitary Administration, during the Camp of Exercise, Punjab, from 1st January till 12th February 1873.

1. *General Health of the Force at Camp of Exercise.*—In my several weekly reports, it has been my satisfactory duty to notice the very favourable state of health which has prevailed among the troops, since the formation of the camp of exercise.

2. This happy condition of things must in no small, in fact in a chief, degree be attributed to the very favourable weather which, with so little interruption, has prevailed; but a good deal may also be put down to the excellent camp arrangements, under which the troops have been well protected from vicissitudes of temperature, as well as from damp; to the good and ample food supplies; the goodness and sufficiency of the water supply at all the stations, and to the great care manifested in all the divisions, to keep the vicinity of the camp in a good sanitary condition.

3. *Sites of the several Camps.*—The sites of all the camps (for the first three

weeks, or more, there were five divisions), were very good and well selected; but it was seen that at Hadjee Sha, close to Gondall where the 2nd Division was located, there was a better site for the Artillery Division than at Hameed, where they were for the first few days. The health of this arm, however, in no way suffered at the last-named place; indeed, throughout the whole period of the manœuvres, the health of the Artillery has been most satisfactory, and their sick list always exceedingly low; some of the batteries being, for weeks, almost without a sick man. *Bengal.*

4. *Hospital arrangements at the Camp.*—During the present camp of exercise, the regiments while in their standing camps had each its own regimental hospital; the system being carried even to separate battery hospitals in the Royal Artillery. This arrangement, however, I consider to have been a mistake, as I believe that if tried on future occasions, one divisional field hospital for Europeans, and one for Natives, will be found sufficient to meet all requirements, as far as the treatment of really sick men is concerned.

5. There should, however, be allowed to each regiment a bell-tent, for the surgeon's professional use, and for protection of his medical stores. In this tent could be seen all men reporting themselves sick, when the surgeon would pass on, to the divisional hospital, all cases of real illness; while, in the case of men with trivial ailments, such as foot-sores and such like trifling disabilities, a few days' excuse from duty would be all that would be required.

6. The divisional field hospitals, European and Native, should be under the immediate charge of the Senior Executive Medical Officer of either service.

7. Such divisional field hospitals, with a general field hospital in a central position, seems to be all that is really necessary; and substituting such hospitals for regimental ones will economise establishments of every kind.

8. During actual field operations, however, should such operation be at any time carried on at some distance, I would say if over eight or ten miles from the more permanent general field hospital, there should be a midway hospital, which (as regards the European troops) should be furnished with all necessary articles of hospital diet and comforts; that is, it should be a regularly dieted hospital, as well as furnished with all necessary supplies of medicines, and of the ordinary medical and surgical appliances.

9. If a man is sent away sick or disabled from his regiment during actual operations, it is not at all unlikely that he will arrive at hospital without his rations; there should therefore always be within easy distance of the force engaged, a regular tent general hospital, where food and all other requirements for a sick man will be available. In the same way there should be some equally suitable arrangements for the sick of the native portion of the force.

10. The locality of these hospitals would, of course, be made known to each Medical Officer early in the day; and their actual position would be indicated by the red cross—the Geneva—flag, which has been in use for the hospitals on the occasion of this present camp of exercise.

11. Under the circumstances of this present camp, the formation of a general hospital, with all the comforts of a regular cantonment one, has been easy, from the fact that at Lawrencepore, the very centre of the position during the greater part of the time the camp of exercise lasted, and in the immediate vicinity of the army head-quarters camp, are barrack buildings which have afforded accommodation of the best description for the sick; and which were capable of holding many more patients than have at any time occupied them. The rooms in the several buildings were duly equipped for about 200 European, and for about 180 native sick; the accommodation for the latter having been supplemented by double-poled tents on raised platforms, up to sufficient for 300 patients.

12. The equipment of these hospitals, and the diet arrangements for the European hospital, were equal in every way to those of the best regimental hospitals in cantonments; indeed, as regards the native hospitals, I may say the diet arrangements were better, as, under the authority of the Commander-in-Chief, many little comforts, such as tea and sugar, in addition to sago, arrowroot, &c., were issued, whenever the surgeon in charge thought necessary, to the native sick soldiers; inexpensive indulgences which were fully appreciated by the sick men.

13. With all the prejudices of caste, however, it is of course impossible

Bengal. ever to attempt anything like a system of dieting in the hospitals of the Native Army in India; and I confess that, until the present occasion, I never fully realized all the difficulties in supplying men seriously ill with the absolute necessaries of life in a large native general field hospital. The prejudices as well as the wants of each individual have to be met by specific purchases in the bazaar; all of these purchases have to be made, and the food prepared, by individuals of the same caste as that of the man who is to consume it. Under such a system, the labours and the difficulties of the Medical Officer are greatly increased, as he has no certainty, that without incessant vigilance on his part, the wants of some of his patients will not be overlooked.

14. In this matter of diet, the advantages are all on the side of the Medical Officer in charge of British troops; he has simply to record, on the man's diet sheet, what he wishes his patient to have, and he need have little anxiety about the man not getting all that has been ordered for him.

15. *Bedding for Native Troops.*—I had some apprehension, before the assembling of the camp, that the native troops might suffer from insufficient bedding during the very cold nights; but, on my inspections of the hospitals, and of the native soldiers' tents in the several camps, I saw that the men were well supplied with warm rezais and other wraps. However, thinking that men might come into the general hospital without sufficient bedding, the Medical Officer in charge made a requisition for three hundred country blankets, the issue of which, on my recommendation, was at once sanctioned by his Excellency the Commander-in-Chief.

16. *Tarpaulins for Floors of Hospital Tents.*—For all the camp hospitals, European as well as native, the Government of India in the Military Department was good enough to sanction the issue of tarpaulins,* and the experience of this camp fully proves that these articles should always form an essential portion of field hospital equipment in India, as they now do elsewhere. In addition to tarpaulins the men had straw or kurbee, so that the sick in hospital were well protected from any coldness or dampness of the ground. In many of the hospitals of British regiments, the doolies, without the tops, were utilized as camp bedsteads.

17. *Prevailing Diseases.*—The disease which has caused most admissions into hospital since the formation of the camp, has been fever, or rather relapses of ague, in men of regiments from the Peshawur valley and its vicinity; but it has been evident to every one, that the change to camp life, and the temporary removal from the locality where the disease was first contracted, have been attended and followed by most beneficial results.

18. The only cases of severe disease which have occurred, and which may be attributed to camp life, have been some cases of pneumonia (inflammation of the lungs), in men probably predisposed to chest affections; and, of the five deaths in the European portion of the force, three were caused by the above disease; while, as mentioned in my first weekly report, several deaths from fever, complicated with pneumonia, occurred in the 1st Punjab Infantry, the health of the regiment having been impaired before it joined the camp.

19. Of the other two deaths among British soldiers, one, that of a gunner of H Battery, 8th Brigade, Royal Artillery, was the result of an accidental gunshot wound; the other was that of an invalid of C Battery, A Brigade, Royal Horse Artillery, who was left at Lawrencepore, being too ill to proceed on the journey to Bombay; this man had not been connected with the camp of exercise, as his battery remained at Peshawur.

20. The sick rate throughout has been something under 2½ per cent.; and the proportion of sick to well much the same among the Europeans and the natives.

This may be considered as a low percentage, even when remembering the fact that weakly men were left in depôt; but laying aside the question of the *rate* of sick, the favourable aspect is the generally mild character of the cases of sickness which occurred; many of the admissions into hospital, moreover, had nothing to do with camp life.

21. Of the numerous admissions, for instance, under the head of fever, but

* The tarpaulins were each 7 feet by 6 feet. This I regard as a very convenient size.

a small proportion were due directly to camp life; although the occasional extra fatigue on field days may have predisposed to some of the relapses of ague. *Bengal.*

22. Only one death, in addition to the three mentioned as having occurred in 1st Punjab Infantry from fever complicated with pneumonia, was entered under the head of fever, the man being under treatment for ague in the Native General Hospital.

23. *Carriage for Sick and Wounded.*—An important subject, connected with camps of exercise, in fact with the medical administration and arrangements of any field force, is that of carriage for the sick and wounded of an army on active service. I may here, therefore, very properly touch on this subject, even if not so fully as I would wish to do.

24. First, we may take the subject of ambulances, properly so called; that is, wheeled conveyances for the removal of sick and wounded men. This division of transport for sick and wounded may, I think, be disposed of very shortly, by saying that where roads exist—even unmetalled roads in dry weather,—an ambulance cart can be utilized; but, in the absence of roads (and in rainy weather of good roads), it is an impracticable mode of transport; while for military operations, away from the line of main roads, it is simply useless. But of the relative value of the ambulance carts now in use, I may observe that the two-wheeled cart might be got along, under circumstances where the long lumbering four-wheeled vehicle would be immoveable, even with its two or three pairs of bullocks; in fact, the long four-wheeled cart is adapted for smooth well-made roads, and for these only.

25. As to the view that the four-wheeled cart is easier for men severely injuried or seriously ill, I regard the doolie as the only proper conveyance for such cases over level ground, and the dandy, or hammock, on the hills. Elsewhere, that is, out of India, the mule litter and the cacolet are used with advantage; but a mule load to be easy (especially for the animal) should be equal on both sides, which, in the case of an ambulance mule, involves the power of carrying with ease and safety two men, in other words from 350 to 400 lbs. I imagine that animals equal to even this carrying power are procurable, although not common in this country.

26. *Hospital Arrangements during Active Field Operations.*—During the field operations of this force, it was considered that a divisional field hospital would suffice, provided it were so arranged that a portion (with a suitable establishment) could be readily detached with any brigade that was not within easy reach of divisional head-quarters. The arrangement is considered to have met all requirements.

27. The existing medical arrangements for regiments while in the field will, however, I think bear improvement; and I would recommend that the immediate medical requirements of a corps should be met by having always with the regiment, and under the immediate eye of the surgeon, a mule with a pair of panniers, arranged as are the field panniers laid down in Her Majesty's Regulations for Hospitals.

28. These panniers always form a part of the medical equipment out of India, and when completed according to the Queen's Regulations, the two panniers weigh 180 lbs., which is an easy load for a mule, but if considered more than the weight for an ordinary sized mule in India, the weight of the panniers could probably be reduced to about 150 lbs.

29. These panniers should contain a reasonable amount of medicines, surgical appliances, and medical comforts, including stimulants; with these means at his disposal the surgeon can do all that is in the first instance necessary for a sick or wounded man.

30. *Preparation and Equipment of Central General Hospitals at Camp of Exercise.*—I may now touch on one or two other points connected with the medical administration of camps of exercise, and the first which I will notice is the preparation and equipment of general hospitals, European and native; for the latter is an essential and necessary requirement; a fact recognized from the first in the Punjab camp, from the experience of the former camp near Delhi, at which latter in the commencement there was no general field hospital for the sick of the native regiments. The requirement was, however, so soon felt that arrangements were made without delay to establish a general hospital for the sick of the native portion of the force.

Bengal.

31. The preparation and equipment of these general hospitals must be in no way dependent on any regimental assistance, in the way of supplies of hospital bedding, clothing, furniture or servants; in fact, when a camp of exercise is decided on, all the general hospital arrangements should be at once considered, and should be completed before the date for the assembling of the force.

32. This is especially necessary in the matter of hospital servants, a sufficient number of whom should be ready for work from the very commencement, although it may be possible afterwards, as was the case on the present occasion, to supplement the number from regiments, as the number of patients in the regimental hospitals diminished, prior to these establishments being broken up, before the commencement of active field operations.

33. The above remarks, regarding servants, apply with just as much force to the natives as to the European general hospital; for to get a sufficiency of servants from native corps is hopeless. As soon as the native general hospital at Lawrencepore was opened, it became necessary to get servants on special indent through the Commissariat Department.

34. *Hospital Servants not obtainable.*—I regret, however, to say that a sufficiency of suitable hospital servants in any way trained cannot be had, especially in the Punjab; although the difficulty is not confined to that locality. At some of my recent inspections of hospitals, especially at Peshawur, I saw not only boys but absolute children paraded as ward coolies.

35. *Necessity for an Enlisted and Trained Hospital Corps in India.*—For this condition of things I believe there is only one effectual remedy—viz., the formation of an enlisted and trained (Native) Army Hospital Corps. When formerly in India, as head of the Medical Department of British troops, I submitted (at the request of Government) a scheme for the formation and organization of such a corps; and I am even more impressed now, than I was then, of its absolute necessity; as a sufficiency of really useful and trustworthy hospital servants is a most essential requirement, which under existing conditions cannot be met.

36. I do not believe the formation of such a corps would add materially to the expenses of hospital establishments, but even if it did so to some moderate extent, the extra expense would be a very justifiable outlay.

37. *Medical Administration at Camps of Exercise or on Active Service.*—During the present camp of exercise, there has been no approach whatever to anything in the shape of double medical administration; there has been one Principal Medical Officer for the Force, aided by a Deputy Inspector-General of Hospitals in each of the three divisions. The Principal Medical Officer being, as a matter of course, responsible to the Commander-in-Chief, and to the Government of India, for everything medical in connection with the camp; while, through the Inspector-General, the Deputy Inspector-General of each division was in some way responsible, to the extent of his charge, for every detail of sanitary and medical administration (British and native), without any reference to the service to which the administrative medical officer belonged. No other system under the circumstances of a camp, or of active service, could ever work, as responsibility cannot be duly fixed, where there is anything like a division of authority. During the present camp of exercise, no difficulty whatever was experienced either by myself, or by the Principal Medical Officers of divisions, in carrying out the principle of a single and undivided system of medical administration.

38. I would add, that where a camp of exercise (as will nearly always be the case) is composed of separate divisions, I regard the presence of an Administrative Medical Officer with each division as essentially necessary, if there is to be any real or effective medical supervision; as no officer can efficiently or satisfactorily carry on the medical administration of even a division, if he is at the same time hampered with an executive charge; to say nothing of the fact, that the officer who might happen to be senior in the division might be ill suited for the duties of administration. On the present occasion, as far as I know, everything connected with sanitation and with divisional medical arrangements has been most satisfactory, and, I believe, chiefly so because there was a Deputy Inspector-General of Hospitals in each division, whose whole time and care were devoted to the above matters.

39. *Convalescent Depôt.*—On the occasion of the present camp of exercise, it was decided to form a convalescent depôt (under canvas) in connection with the European general hospital; this arrangement was found to answer very well, as the men, on complete recovery, could be at once sent to their regiments, whereas, had they been sent from the hospital to their own regimental depôts, there would have been less facility for getting them back to their regiments in the field. *Bengal.*

40. *Advantages in a health point of view of Camps of Exercise.*—It will be the province of others to point out the advantages to officers and men which, in a military point of view, are derivable from the formation of camps of exercise; but as regards the health aspect of the question, I consider the advantages, especially in such a climate as that of the locality between Rawulpindee and Attock in the winter months, to be of the very highest kind; in fact it was evident to every one that the health of every regiment, European and native, was greatly bettered by the active exercise in the open air, which is inseparable from the duties of a camp life. During the latter operations, when the men had a month's physical training, they seemed not to feel any amount of marching, or of work which was imposed on them, during that period of the day allotted for the continuance of field manœuvres—viz., from 10 A.M. till 4 P.M.

41. From the above considerations, which were obvious to every one, of the great benefits which men derive in this country from active exercise in the open air during the winter months, I would like to see the system of sending men by rail, in course of ordinary reliefs, entirely done away with in North-Western and Northern India, and route-marching substituted. It is only by such means and at such seasons in the plains, that the physique of the men can be developed, and all the evils of continued inaction during the hot weather got rid of; for it is not difficult to comprehend how an inactive life, with full living and pretty free use of beer and spirits, is at the bottom of much of the disease that kills and invalids soldiers in this country.

42. There is one other matter which I may notice, as I feel sure it only requires to be mentioned to be rectified on future occasions; it is a matter affecting a large and useful body of men, viz.—the public camp followers, whose presence and whose efficiency are so essential to the operations of an active field force; for these men, as for the more purely fighting element, due provision should be made, in the way of tents to protect them from the weather; from want of this provision, many of those at the camp of exercise suffered great privation, until the authorities on the spot managed to procure some shelter for them.

G. S. BEATSON,
Inspector-General of Hospitals, and
Principal Medical Officer, Camp of Exercise.

Head-Quarters Camp,
Lawrencepore, 13th Feb. 1873.

II.—MADRAS.

STATISTICAL REPORT.

Madras.

The average strength of the European troops serving in the Madras Command in 1872 was 11,511; the admissions into hospital among them were 15,240; and the deaths, including nine of invalids at sea on the voyage home, and two at Netley, amounted to 229. The proportions per 1,000 of the strength represented by these numbers are, for admissions 1,324, and for deaths 19·89; the former being in excess of the corresponding ratio for 1871 by 112·5, but below the average for the preceding 10 years by 43; and the latter lower than the ratio for the preceding year by 1·46, and below the average for the 10 years by 3·25.

The admissions and deaths from the different classes and orders of diseases are shown in the following Table, framed from Abstract No. 19 in the Appendix:—

Madras.

Orders.	Diseases.	Strength, 11,511.				Ratio per 1,000 of Mean Strength.			
						1872.		1869–71.	
		Admitted.	Deaths.			Admitted.	Died.	Admitted.	Died.
			In the Command.	Of Invalids.	Total.				
	I. *General Diseases.*								
1	Febrile Group ..	3,964	40	..	40	344·4	3·47	215·5	5·53
2	Constitutional ,, ..	1,689	23	4	27	146·7	2·35	170·5	1·97
	II. *Local Diseases.*								
	Diseases of the—								
1	Nervous System ..	220	34	..	34	19·1	2·95	22·6	2·46
2	Eye	232	..	..	..	20·1	..	23·2	..
3	Ear	139	..	..	..	12·1	..	8·1	..
4	Nose	9	..	..	..	·8	..	·4	..
5	Circulatory System ..	168	22	2	24	14·6	2·08	15·0	2·11
6	Absorbent ,, ..	319	..	..	..	27·7	..	24·0	..
8	Respiratory ,, ..	509	2	2	4	44·2	·35	43·8	·65
9	Digestive ,, ..	4,103	74	2	76	356·4	6·60	346·4	8·16
10	Urinary ,, ..	780	4	1	5	67·8	·43	89·2	·06
11	Generative ,, ..	138	..	..	..	12·0	..	17·4	..
12	Organs of Locomotion	57	..	..	..	5·0	..	5·9	·06
13	Cellular Tissue ..	246	1	..	1	21·4	·09	16·3	..
14	Cutaneous System ..	984	..	..	..	85·5	..	96·2	..
	III. *Conditions, &c.*								
	Debility ..	451	..	..	..	39·2	..	44·2	·13
	IV. *Poisons* ..	52	4	..	4	4·5	·35	15·4	·71
	V. *Injuries.*								
2	Accidental	1,156	10	..	10	100·4	·87	117·2	1·20
3	Homicidal	3	1	..	1	·3	·09	..	·06
4	Self-inflicted	1	2	..	2	·1	·17	·2	·65
6	Judicial	..	1	..	1	..	·09	..	..
	VI. *Surgical Operations*	6	..	..	..	·5	..	·1	..
	No appreciable disease	14	..	..	..	1·2	..	1·2	..
	Total	15,240	218	11	229	1324·0	19·89	1272·8	23·75
	Average of 10 years, 1862–71	..	..	..	..	1367·0	23·14	..	..

General Diseases.—Compared with the results for 1871, there was a very large increase in the ratio of admissions for diseases of this class, which was also much in excess of the average for the three preceding years, but a considerable decrease in the ratio of mortality from them. The increase in the admissions was confined entirely to the febrile group, those for diseases of the constitutional group being considerably below the average. The reduction of mortality extended over both groups.

The following Table shows the proportion of the sickness and mortality caused by the principal diseases of this class :—

General Diseases.	Admitted.	Died.	Ratio per 1,000 of Mean Strength.			
			1872.		1869-71.	
			Admitted.	Died.	Admitted.	Died.
Febrile—						
Eruptive Fevers	35	2	3·0	·17	·8	·10
Continued „	2,495	31	216·7	2·69	77·6	1·42
Paroxysmal „	1,402	3	121·8	·26	126·5	·74
Malignant Cholera	..	..	..	..	5·5	3·11
Cholera	2	2	·2	·17	·6	·10
Influenza	12	..	1·1	..	2·0	..
Erysipelas	11	1	1·0	·09	1·8	·03
Other Diseases of this group.	7	1	·6	·09	·7	·03
Total	3,964	40	344·4	3·47	215·5	5·53
Constitutional—						
Rheumatism	446	..	38·7	..	45·6	·03
Syphilis	1,057	3	91·8	·26	102·5	·19
Scrofula, Phthisis, &c. ..	147	22	12·8	1·91	14·0	1·49
Scurvy and Purpura ..	7	..	·6	..	·8	·03
Anæmia	24	..	2·1	..	6·7	..
Other Diseases of this group.	8	2	·7	·17	·9	·23
Total	1,689	27	146·7	2·34	170·5	1·97

Eruptive Fevers caused nearly three times as many admissions as in 1871, but the deaths from them, though above the average, amounted only to two. Of 35 admissions, 18 were for small-pox, from which disease also both the deaths occurred, six for the effects of vaccination, one for chicken-pox, seven for measles, and three for scarlet fever.

Continued Fevers were more than twice as prevalent as during the preceding year, the excess being due in a great measure to an epidemic of dengue, which was introduced at Cannanore in the beginning of January by an infected transport from Bombay (Her Majesty's steamer "Dalhousie"), and in Burmah in April by passenger steamers from Calcutta. Towards the end of the latter month it appeared in the Royal Artillery at St. Thomas's Mount, and immediately afterwards in the Infantry regiment in Fort St. George, Madras, the contagion having, it is believed, been brought to both stations by small parties of men from Poona, where the disease was then very prevalent. In September it broke out in the Infantry detachment at Trichinopoly, the contagion having no doubt been brought from Fort St. George, where the disease was still prevalent in the regiment furnishing that detachment (the 2nd Battalion 21st Foot). The history of the epidemic until its arrival at Poona will be given in the report on the health of the troops in the Bombay Command.

In the Madras Command it caused 917 admissions among the men (of which 397 were in Burmah); 59 among the officers; 83 among the women; and 111 among the children; the proportions per 1,000 of the mean strength represented by these numbers being, for the men, 79·66; for the officers, 137·20; for the women, 57·48; and for the children, 41·79. These ratios, however, represent but a small proportion of the attacks in the two last classes, as from the want of sufficient hospital accommodation, and other causes, the majority of the women and children affected by the disease were treated for it in their quarters. No deaths were recorded from dengue among the officers, men, and women, but there were three among the children, the fatal result in each being apparently due to cerebral complication, and one man, whose death appeared under another head, was attacked by the head symptoms which proved fatal while under treatment for this disease. It was observed elsewhere as to this epidemic that during the hot season, which appears to be that most favourable for the spread of the disease,

Madras. and at which its symptoms attain their maximum of severity, the predisposition to insolation which attends it, constitutes the chief or rather the only danger to life involved by it, so far as adults are concerned. The outbreaks at particular stations will be noticed subsequently.

Simple Continued Fevers caused 1,041 admissions into hospital, which represent a ratio of 90·43 per 1,000 of the strength, the corresponding ratio for the preceding year having been 35·10. The deaths from it, however, five in number, only exceeded by one those in 1871. The increased prevalence of this disease is to be attributed to the youth and short Indian service of a large proportion of the men, particularly in the regiments quartered at the hottest stations. Most of the cases were of the ardent type, attributable directly to the heat of the weather, and they occurred chiefly during the hot season, and among men who had not yet been exposed to malaria.

From *febricula* there were 458 admissions, representing a ratio of 39·79 per 1,000 of the strength. The cases admitted under this head were, as usual, almost entirely attributable to intemperance, and adding to them those admitted under *dyspepsia*, *delirum tremens*, and *poisoning by alcohol*, the other heads under which such cases are usually returned, it appears that the ratio of admissions for the direct results of that vice was 119·45 per 1,000 of the strength.

Enteric Fever caused 79 admissions into hospital and 26 deaths, or 6·86 of the former, and 2·26 of the latter per 1,000 of the strength, a higher proportion of both than during any former year. The apparently high proportion borne by the deaths to the admissions was probably the result of some of the slighter cases being returned under other heads. To bring the cases up to the usual proportion borne by them to the deaths, at least 70 would have to be added to their number. The increased prevalence of the disease in 1872 was, no doubt, in some measure due to the increased proportion of young soldiers serving at the stations at which it chiefly occurs.

Paroxysmal Fevers caused 1,402 admissions into hospital, and three deaths, which represent the ratios of 121·79, and ·26 per 1,000 of the strength, those for the preceding year having been 102·02 and ·66. Two-thirds of the admissions, and all the deaths, occurred at Kamptee.

Cholera did not prevail in an epidemic form among the troops in any part of the Command, and only two admissions were caused by it during the year. Both the cases admitted, however, proved fatal, one at Kamptee, in June, the other at Secunderabad, in November.

Rheumatism was less prevalent than during the preceding year, and considerably below the average, the reduction being probably attributable to the increased proportion of young soldiers of short Indian service in the Command.

In *Syphilis* also there was a reduction, the proportion of admissions for it per 1,000 of the strength having been 91·8, which is 1·9 below the ratio for 1871, and 10·7 below the average for the three years from 1869 to 1871.

Scrofula and *Phthisis* caused fewer admissions, but more deaths, than during the preceding year, the mortality being also above the average, though less than two per 1,000 of the strength.

Anæmia.—The admissions under this head scarcely exceeded a third of those in 1871, or of the average for the three years from 1869 to 1871. The reduction is probably attributable to the same cause as that in rheumatism.

Local Diseases.—*Diseases of the nervous system* were less prevalent than during the preceding year, but more than twice as fatal, the particular affections by which the increase of mortality was caused being sunstroke and apoplexy, from which respectively there were 18 and 10 deaths.

In the prevalence of diseases of the *circulatory* and *respiratory systems* there was little change.

In that of diseases of the *digestive system* there was a slight increase, and it was as usual greatly the most fatal order, the deaths from it, though below the average, amounting to nearly double those from any other order.

In diseases of the *urinary system* there was a large decrease, the reduction being observed chiefly in gonorrhœa and its sequelæ, from which the admissions were in the ratio 66·63 per 1,000 of the strength.

Conditions, &c.—The admissions for debility were fewer than during the preceding year, and considerably below the average.

Poisons,—The admissions under this head were fewer by nearly a half than during the preceding year, and below the average for the three years from 1869 to 1871 by more than two-thirds. With one exception, all were for delirium tremens, of which the proportion of cases admitted per 1,000 of the strength was 4·43.

Injuries.—*Accidental injuries* requiring admission to hospital were fewer by 14 per 1,000 of the strength than during the preceding year, and the mortality from them also was rather lower. There were only two deaths by suicide, the number in 1871 having been nine. One man was murdered by rifle shot; and one was executed by hanging.

The following Table shows the amount of sickness and mortality at each of the principal stations in the Command:—

Stations.	Average Annual Strength.	Admitted into Hospital.	Died in India.	Ratio per 1,000 of Strength.			
				Admitted.	Died.	Average of previous Periods	
						Admitted.	Died.
Presidency Circle. Fort St. George and Palaveram	707	1,425	13	2,016	18·39	1,511	22·12
Presidency Circle. St. Thomas's Mount	398	570	8	1,432	20·10		
Presidency Circle. Trichinopoly ..	311	410	5	1,318	16·08	1,415	17·23
Presidency Circle. Bellary	794	1,102	5	1,262	6·30	1,388	14·32
Mysore Circle. Bangalore ..	1,769	2,202	27	1,245	15·26	1,061	13·81
Mysore Circle. Cannanore ..	746	948	10	1,268	13·41	1,115	14·84
Mysore Circle. Calicut	88	78	1	886	11·36		
Mysore Circle. Malleapooram ..	96	75	2	781	20·83		
Hydrabad Circle. Secunderabad ..	2,559	3,475	72	1,358	28·14	1,471	24·99
Hydrabad Circle. Kamptee ..	999	2,079	21	2,081	21·02	1,646	18·59
Hydrabad Circle. Seetabuldee ..	47	76	1	1,617	21·28		
Burmah Circle. Rangoon	842	877	15	1,042	17·81	1,307	13·80
Burmah Circle. Thayetmyo ..	562	501	3	891	5·34	1,429	28·04
Burmah Circle. Tonghoo	464	466	7	1,004	15·09	1,243	14·78
Burmah Circle. Port Blair ..	110	58	..	527	..	1,286	14·47
Depôts Poonamallee ..	147	361	11	2,456	74·83	2,725	69·95
Depôts Ramandroog ..	22	7	..	318	..	1,624	31·71
Depôts Wellington ..	282	345	3	1,223	10·64	1,216	16·63
Troops on the March	279	221	12	773	43·01	..	..

Compared with the results for 1871, this shows a large increase in the ratio of admissions to hospital at Fort St. George, and St. Thomas's Mount, attributable to the epidemic of dengue at these stations, and at Bellary and Kamptee, where it was probably due to the youth and short Indian service of the 48th and 44th Regiments,—and a slighter increase at Trichinopoly, Bangalore, Cannanore, and Secunderabad;—a large reduction in the ratio of admissions at Rangoon, Thayetmyo, Tonghoo, and Port Blair,—and a moderate reduction at all the Depôts. The ratio of deaths was increased at Bangalore, Kamptee, Rangoon, Tonghoo, and Poonamallee; reduced at Trichinopoly, Bellary, Cannanore, Secunderabad, Thayetmyo, and Port Blair; and nearly the same as during the preceding year at the other stations.

Leaving out of account the Depôts, the ratio of admissions was highest at Kamptee and Fort St. George, and lowest at Port Blair and Malleapooram. That of deaths was highest at Secunderabad, Seetabuldee, and Kamptee, and lowest at Port Blair (where there were no deaths), Thayetmyo and Bellary, at each of which it was considerably below the ratio for the United Kingdom.

The following Table shows the proportion of sickness and mortality caused by each class and order of diseases in each of the Administrative Circles:—

Orders.	Stations	Presidency Circle.		Mysore Circle.		Hydera-bad Circle.		Burmah Circle.		Depôts.		On the March.		Presidency Circle.		Mysore Circle.		Hyderabad Circle.		Burmah Circle.		Depôts.		On the March.	
	Strength	2,210		2,701		3,605		1,978		451		279		Annual Ratio per 1,000 of Strength.											
	Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
	1. *General Diseases.*																								
1	Febrile Group	881	2	495	11	1,857	24	541	1	106	1	59	...	398·6	·91	183·3	4·07	515·1	6·66	273·5	·51	235·0	2·22	211·4	...
2	Constitutional ,, ...	432	6	352	3	552	6	191	3	125	2	19	3	195·5	2·71	130·3	1·11	153·1	1·66	96·6	1·51	277·2	4·44	68·1	10·75
	II. *Local Diseases.*																								
	Diseases of the—																								
1	Nervous System	54	9	39	5	76	13	19	2	26	3	3	2	24·4	4·07	14·4	1·85	21·1	3·61	9·6	1·01	57·6	6·64	7·1	7·17
2	Eye	69	...	49	...	81	...	22	...	10	...	2	...	31·2	...	18·1	...	22·5	...	11·1	...	22·2	...	7·2	...
3	Ear	43	...	32	...	59	...	1	...	4	...	1	...	19·4	...	11·8	...	16·4	...	·5	...	8·9	...	3·6	...
4	Nose	2	...	...	...	4	...	2	...	2	...	...	...	·9	...	...	...	1·1	...	1·0	...	4·4	...	...	...
5	Circulatory System	26	4	71	4	27	8	20	3	16	2	2	1	11·8	1·81	26·3	1·48	7·5	2·22	10·1	1·51	35·5	4·44	7·2	3·58
6	Absorbent ,, ...	74	...	64	...	141	...	19	...	23	...	4	...	33·5	...	23·7	...	39·1	...	9·6	...	51·0	...	14·3	...
8	Respiratory ,, ...	149	1	140	...	151	1	48	...	15	...	7	...	67·4	·45	51·8	...	41·9	·28	24·3	...	33·3	...	25·1	...
9	Digestive ,, ...	753	8	1,002	11	1,516	37	485	7	256	6	77	5	340·7	3·62	371·0	4·07	420·5	10·26	245·2	3·54	567·6	13·30	276·0	17·93
10	Urinary ,, ...	186	...	201	...	272	2	102	1	10	...	5	1	84·2	...	74·4	...	75·4	·55	51·6	·51	22·2	...	17·9	3·58
11	Generative ,, ...	32	...	40	...	27	...	32	...	6	...	2	...	14·5	...	14·8	...	7·5	...	16·2	...	13·3	...	7·2	...
12	Organs of Locomotion	17	...	8	...	16	...	9	...	6	...	1	...	7·7	...	3·0	...	4·4	...	4·6	...	13·3	...	3·6	...
13	Cellular Tissue	75	...	34	1	95	...	24	...	10	...	2	...	33·9	...	12·6	·37	26·4	...	12·1	...	22·2	...	7·2	...
14	Cutaneous System	225	...	280	...	291	...	154	...	24	...	7	...	101·8	...	103·7	...	80·7	...	77·9	...	53·2	...	25·1	...
	III. *Conditions, &c.*																								
	Debility...	83	...	128	...	119	...	72	...	49	...	7	...	37·6	...	47·4	...	33·0	...	36·4	...	108·6	...	25·1	...
	IV. *Poisons*	11	...	13	1	19	1	6	2	2	...	2	...	5·0	...	4·8	·37	5·3	·28	3·0	1·01	4·4	...	7·2	...
	V. *Injuries.*																								
2	Accidental	293	2	341	1	323	2	152	5	23	...	21	...	132·6	·91	126·2	·37	89·6	·55	76·8	2·53	51·0	...	75·2	...
3	Homicidal	...	...	1	1	1	...	1	...	...	...	...	...	...	...	·4	·37	·3	...	·5	...	...	...	...	...
4	Self-inflicted	...	...	1	1	...	...	...	1	...	...	...	...	...	...	·4	·37	...	...	...	·51	...	...	...	...
6	Judicial	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	·37	...	...	...	...	...	...	...	...
	VI. *Surgical Operations* ...	2	...	1	...	2	...	1	...	...	...	...	...	·9	...	·4	...	·5	...	·5	...	...	...	...	...
	No appreciable disease	...	...	12	...	1	...	1	...	...	...	...	...	...	...	4·4	...	·3	...	·5	...	...	...	...	...
	Total	3,407	32	3,304	40	5,630	94	1,902	25	713	14	221	12	1541·6	14·48	1223·2	14·80	1561·7	26·07	961·6	12·64	1580·9	31·04	792·1	43·01

Stations	Presidency Circle.		Mysore Circle.		Hyderabad Circle.		Burmah Circle.		Depôts.		On the March.		Presidency Circle.		Mysore Circle.		Hyderabad Circle.		Burmah Circle.		Depôts.		On the March.	
Strength	2,210		2,701		3,605		1,978		451		279		Annual Ratio per 1,000 of Mean Strength.											
General Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Febrile—																								
Eruptive Fevers	3	...	18	...	12	2	1	...	...	...	1	...	1·4	...	6·7	...	3·3	·56	·5	...	...	...	3·6	...
Continued „	791	2	357	11	802	17	445	...	69	1	7	...	357·9	·90	132·2	4·07	222·5	4·71	225·0	...	153·0	2·22	25·1	...
Paroxysmal Fevers	84	...	115	...	1,023	3	90	...	37	...	51	...	38·0	...	42·6	...	283·8	·83	45·5	...	82·0	...	182·8	...
Malignant Cholera	...	...	...	...	1	2	...	...	...	...	...	...	...	...	...	...	·3	·56	...	...	...	...	...	...
Influenza	...	...	...	...	12	...	...	...	...	...	...	...	...	...	...	...	3·3	...	...	...	...	...	...	...
Erysipelas	3	...	4	...	3	...	2	...	...	...	...	...	1·4	...	1·5	...	·8	...	1·0	...	...	...	...	...
Other Diseases of this Group ...	...	...	1	...	4	...	3	1	...	...	...	...	...	...	·4	...	1·1	..	1·5	·51	...	...	...	...
Total of Febrile Group ...	881	2	495	11	1,857	24	541	1	106	1	59	...	398·7	·90	183·4	4·07	515·1	6·66	273·5	·51	235·0	2·22	211·5	...
Constitutional—																								
Rheumatism	116	...	122	...	108	...	42	...	44	...	5	...	52·5	...	45·2	...	30·0	...	21·2	...	97·6	...	17·9	...
Syphilis	281	...	175	2	402	1	133	...	50	...	10	...	127·2	...	64·8	·74	111·5	·27	67·2	...	110·9	...	35·9	...
Scrofula, Phthisis, &c.	32	6	42	1	29	3	10	3	26	2	4	3	14·5	2·71	15·5	·37	8·0	·83	5·1	1·51	57·6	4·44	14·3	10·75
Scurvy and Purpura	1	...	...	...	1	...	5	...	...	...	...	...	·4	...	...	...	·3	...	2·5	...	...	...	...	...
Anæmia	2	...	11	...	7	...	...	...	3	...	...	...	·9	...	4·1	...	1·9	...	...	...	6·7	...	...	...
Other Diseases of this Group ...	...	...	2	...	5	2	1	...	2	...	...	...	...	...	·7	...	1·4	·56	·5	...	4·4	...	...	...
Total of Constitutional Group	432	6	352	3	552	6	191	3	125	2	19	3	195·5	2·71	130·3	1·11	153·1	1·66	96·5	1·51	277·2	4·44	68·1	10·75

Madras. GENERAL DISEASES were more prevalent than during the preceding year in all the Circles, the increase being most marked in the Presidency and Hyderabad ones. The mortality from them, however, was lower in all except the Presidency and Mysore Circles. Except in the same two Circles, the increase in the ratio of admissions was confined to the febrile group of diseases.

Eruptive Fevers were more prevalent than usual in the Mysore and Hyderabad Circles, in both of which small-pox prevailed to a great extent among the civil population. Of the 18 cases of that disease among the troops admitted during the year, eight occurred at Bangalore, seven at Kamptee and Seetabuldee, two at Secunderabad, and one at Bellary. Of the two deaths from it, one occurred at Kamptee, the other at Seetabuldee. Both patients bore good marks of vaccination. Owing to the epidemic prevalence of the disease, re-vaccination was practised to a greater extent than usual among the troops. In 2,286 cases in which that operation was performed, the result was a perfect vaccine vesicle in 1,118, a modified one in 545, and a failure in 623.

Of the admissions for scarlet fever, two occurred at Rangoon, and one at Kamptee. At the latter station the contagion of the disease is stated to have been imported from Ireland with the 44th Regiment. This has happened several times since the establishment of the system of steam transport by the Red Sea; but fortunately the conditions met with in India do not appear to be favourable for the spread of that disease, and it has on each occasion died out in no very long time. Of the seven cases of measles, four occurred at Bangalore, two at Kamptee, and one at Secunderabad.

Continued Fevers were greatly more prevalent than during the preceding year in all the Circles, and at the Depôts. The excess in the first three Circles was due in a great measure to the epidemic prevalence of dengue in them. The sources from which that disease was introduced have already been mentioned. The extent of its prevalence at each of the stations at which it appeared, and the number of admissions for it during each month of the year, are shown in the following Table, extracted from the Principal Medical Officer's Report:—

Circles.	Stations.	Admissions for Dengue.												Total.	
		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Admitted.	Ratio per 1000 of Strength.
Presidency	Madras ...	...	...	...	3	5	43	88	85	51	14	...	...	289	434·59
	St. Thomas's Mount	...	...	...	12	84	9	4	...	2	...	...	...	111	278·89
	Palaveram ...	...	...	...	...	...	...	...	...	...	...	1	...	1	23·81
	Trichinopoly ...	...	...	...	...	...	...	...	...	18	20	1	1	40	128·61
Mysore	Bangalore ...	...	...	...	3	...	...	...	...	...	...	...	...	3	1·70
	Cannanore ...	29	2	...	...	...	...	...	...	...	...	...	...	31	41·55
Hyderabad	Secunderabad ...	...	...	...	1	...	...	...	...	...	...	...	...	1	·39
Burmah	Rangoon ...	...	...	...	3	75	67	35	9	...	...	...	...	189	224·46
	Thayetmyo ...	...	...	...	...	65	44	27	6	...	...	...	...	142	252·67
	Tonghoo ...	...	...	...	...	...	...	...	20	30	8	7	1	66	142·24
Depôts ...	Poonamallee ...	...	...	...	...	...	...	7	32	...	...	...	...	39	265·30
	Total ...	29	2	...	22	229	163	161	152	101	42	9	2	912	107·23

Enteric Fever.—The increased prevalence of this form of fever, and the increased mortality resulting from it occurred chiefly in the Mysore and Hyderabad Circles. The following Table, framed by Surgeon-General Currie, C.B., shows the particular stations at which the admissions and deaths occurred, and their number and proportion to the strength at each.

Circles.	Stations.	Admissions for Enteric Fever.												Total.		Deaths.	
		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Number Admitted.	Ratio per 1,00 of strength.	Number.	Ratio per 1,000 of strength.
Presidency	St. Thomas's Mount ...	....	....	....	....	....	....	1	1	....	....	....	1	3	7·54	1	2 51
Mysore ...	Bangalore	....	4	3	....	3	3	3	5	1	....	....	....	22	12·44	7	3·96
	Cannanore	1	....	....	....	....	1	....	....	....	....	....	14	16	21·45	4	5·36
Hyderabad	Secunderabad ...	2	2	4	1	8	1	1	4	9	3	....	....	35	73·67	13	5·08
Burmah	Rangoon... ...	1	1	....	....	....	....	....	....	....	....	....	....	2	2·37	....	....
Depôts	Wellington ...	....	....	1	....	....	....	....	....	....	....	....	....	1	3·54	1	3·54
	Total	4	7	8	1	11	5	5	10	10	3	...	15	79	11·98	26	3·94

The next two Tables, also extracted from Surgeon-General Currie's Report, show the number and proportion of the admissions and deaths at each age and each period of service in India, three of the admissions in the 2nd Battalion 24th Regiment being excluded in consequence of the incompleteness of the return furnished for that Regiment.

Ages.	Number Admitted for Enteric Fever.	Percentage of Total Admissions for Enteric Fever.	Number of Deaths from Enteric Fever.	Percentage of Total Deaths from Enteric Fever.
17 to 18	1	1·31	1	3·84
18 to 19	6	7·90	2	7·69
19 to 20	13	17·11	6	23·09
20 to 21	14	18·42	4	15·38
21 to 22	6	7·90	..	..
22 to 23	12	15·79	5	19·25
23 to 24	4	5·26	2	7·69
24 to 25	3	3·95	2	7·69
26 to 27	2	2·63	2	7·69
27 to 28	3	3·95	1	3·84
28 to 29	3	3·95	..	..
29 to 30	1	1·31	..	..
30 to 31	5	6·58	..	..
31 to 32	1	1·31	1	3·84
32 to 33	2	2·63	..	..
Total	76	100·00	26	100·00

Service in India.	Number Admitted for Enteric Fever.	Percentage of Total Admissions for Enteric Fever.	Died of Enteric Fever.	Percentage of Total Deaths from Enteric Fever.
Under 1 year	36	47·37	12	46·15
1 to 2 years	15	19·74	5	19·23
2 to 3 „	8	10·53	5	19·23
3 to 4 „	2	2·63	1	3·85
4 to 5 „	6	7·91	3	11·54
5 to 6 „	1	1·31	..	..
6 to 7 „	3	3·94	..	..
7 to 8 „	3	3·94	..	..
8 to 9 „	2	2·63	..	..
Total	76	100·00	26	100·00

Madras. The addition to the last two tables of the strength of the several classes at the stations at which enteric fever prevailed would have added greatly to their value, but the returns do not enable it to be furnished.

It will be seen that the stations at which the disease chiefly prevailed were Bangalore, Cannanore, and Secunderabad; that, except at Cannanore, where an outbreak took place in December in the 43rd Light Infantry, which had landed there from England in November, the period during which the majority of the cases occurred, was that between May and September; that the great majority of cases occurred in young soldiers under 23 years of age, and of less than three years' Indian service; and that the mortality was very nearly in the proportion of one death in three cases, but that it was *higher* among the younger men than among those of more mature age.

At Bangalore 17 of the 22 cases admitted occurred in the corps located on either side of a ravine, which separates the barracks of the Horse Artillery from those of the Foot Artillery and the Cavalry Regiment, about which locality the disease appears to have hung ever since, a considerable number of years ago, the native population of a village in the ravine was more than decimated by it. The impure water from the foul wells in that ravine was in former years strongly suspected of being an active agent in the propagation of the disease, but the Principal Medical Officer does not think that any such influence can now be attributed to it, as during the period in 1872 when the disease was most prevalent the men were supplied with water from the "Dhobie's wells" exclusively. This would be conclusive if there were any assurance that the men did not frequent the villages in the ravine and drink the water there. As the barracks on the Race Course at Bangalore, and those at Trimulgherry (Secunderabad), occupied by the 2nd Battalion of the 24th Regiment, in which the disease was most prevalent at that station, are reported to be free from any serious sanitary defects, it is probable that in either case its continued prevalence is due to the existence of some external source of contagion in the native quarters frequented by the men. At Cannanore the outbreak of the disease in December was obviously connected with the arrival during the previous month of a new regiment consisting largely of very young and immature men. There is no suspicion of its having been imported by them, as no case had occurred in the regiment for years before its embarkation, and it is known to have existed at the station at any rate during its occupation by the last three regiments which have been stationed there, though in the Royal Regiment, the first of the three, which consisted chiefly of old soldiers, the cases were comparatively few. The water supply provided for the troops, which is procured from wells sunk in the laterite rock, does not appear to be liable to suspicion; but there is a native village of more than usual filth within a few hundred yards of the barracks, which are arranged in the form of a square, with a latrine on the old and abominable "tarred tub" system at each angle, so that the atmosphere in the rooms must be contaminated by the effluvia, from whatever quarter the wind may blow. The disease did not on this occasion extend to the outposts at Calicut and Malleapooram.

Simple Continued Fever was greatly most prevalent in the Hyderabad Circle, and more particularly at Kamptee, where the unacclimatized men of the 44th suffered severely from it during the hot season. As a rule, however, the cases of ardent fever at that station are reported to have been of moderate severity and of short duration.

Paroxysmal Fevers were greatly more prevalent than during the preceding year in the Hyderabad Circle, and among the troops on the march, but less so in all the other Circles. The excess in the Hyderabad Circle was due to the prevalence of ague in the 44th Regiment at Kamptee, at which station also the only three deaths from paroxysmal fever recorded in the Command during the year took place. The period during which ague was prevalent at Kamptee was, as usual, that subsequent to the setting in of the rains, the febrile attacks during the hot season having been of the ardent type.

Cholera did not prevail in an epidemic form in any of the Circles. The only two cases of it among the troops in the Command were in the Hyderabad Circle.

Rheumatism was greatly more prevalent than in 1871 in the Presidency Circle, at the Depôts, and among the Troops on the March, but greatly less so

in all the other Circles. Omitting the Depôts, the inefficiency caused by it was greatest in the Presidency Circle, and, after it, in the Mysore Circle; Madras in the former, and Bangalore in the latter, being the particular stations at which the admissions for it were in the highest ratio. *Madras.*

Syphilis caused a higher proportion of admissions than during the preceding year in the Presidency and Mysore Circles, and a lower proportion in all the others. The ratio was highest in the Presidency Circle, chiefly from the great prevalence of the disease at Bellary, at which station it amounted to 222·92 per 1,000 of the strength. In the Hyderabad Circle the ratio continued high, though considerably lower than during the preceding year. At Secunderabad it amounted to 119·18, and at Kamptee and Seetabuldee to 92·73 per 1,000 of the strength. At Rangoon it was 98·57, at St. Thomas' Mount 97·99, at Bangalore 89·32, at Madras 67·57, and at Cannanore only 14·74. In the small detachment at Palaveram there were no admissions, and in those at Ramandroog and Malleapooram respectively there was but one each, but in that at Calicut, which differs from those above named in being near a large native town, the ratio amounted to 56·82.

The Contagious Diseases Act, though at most stations very inefficiently carried out, is believed to be productive of a good effect; but the reduction in the prevalence of syphilis in the Command, though progressive, has been for some years very slow. The circumstances of the different stations occupied by European troops are, however, so diverse, that the efficacy of the Act should be judged of from the comparative prevalence of syphilis at each now and before the establishment of the preventive measures, rather than from its comparative prevalence at protected and unprotected stations.

Scrofula and Phthisis.—There was a reduction in the ratio of admissions for these diseases in all except the Mysore and Hyderabad Circles, but an increase in that of mortality from them in all except the Mysore Circle. The stations at which the ratio of admissions was highest were St. Thomas's Mount and Cannanore.

Anæmia.—The admissions under this head, which were much above the average in 1871 in the Mysore and Hyderabad Circles, were greatly less numerous than during that year, their ratios per 1,000 of the strength having fallen from 5·8 and 12·9 to 4·1 and 1·9.

Local Diseases.—*Diseases of the Nervous System* caused a smaller proportion of admissions than during the preceding year in all except the Hyderabad Circle, but a higher ratio of mortality in all except the Burmah one. Omitting the Depôts, both the admissions and the deaths were in the highest ratio in the Presidency Circle, and next to it in the Hyderabad Circle. The most prevalent disease of the order was neuralgia, which caused nearly half the admissions; and the most fatal one was sunstroke, from which there were 19 deaths—viz., 5 at Secunderabad, 4 at Madras, an equal number at Kamptee, 2 at Bellary and Poonamallee respectively, 1 at St. Thomas's Mount, and 1 at Bangalore. From apoplexy, which came next in the order of fatality, there were 3 deaths at Secunderabad, 2 at Bangalore, 1 at each of the following stations, Rangoon, Tonghoo, Cannanore, and Wellington, and one on the march.

Diseases of the Eyes were less prevalent than during the preceding year in all the Circles except the Presidency one, in which the ratio of admissions was raised by the prevalence of a mild form of catarrhal-ophthalmia ("country sore eyes,") in the 48th Regiment, at Bellary, in October and November.

Diseases of the Circulatory System were considerably less prevalent than in 1871 in the Presidency, Hyderabad, and Burmah Circles, at the Depôts, and among the Troops on the March, but rather more so in the Mysore Circle. The mortality from them was increased in the Hyderabad Circle, at the Depôts, and among the Troops on the March, reduced in the Presidency and Burmah Circles, and the same as in 1871 in the Mysore Circle. Omitting the Depôts, the ratio of admissions for them was highest in the Mysore Circle, and that of deaths in the Hyderabad Circle. The most prevalent diseases of the order were palpitation, and valve-disease of the heart; and the most fatal were valve-disease of the heart and aneurism of the aorta, from each of which there were 8 deaths.

Diseases of the Respiratory System.—There was an increase in the prevalence

Madras. of this order of diseases in all the Circles except the Burmah one, but they were very little in excess of the average of former years, and the mortality from them was everywhere reduced. Only two deaths were caused by them in the Command, one from laryngitis, the other from bronchitis. The great majority of the admissions were caused by the latter disease.

Diseases of the Digestive System.—Except in the Circles in which dengue prevailed in an epidemic form, the admissions for diseases of this order exceeded those for any other, and, except in the Mysore Circle, the deaths from them also were more numerous than those from any other order. The admissions were in a much higher ratio than in 1871 in the Presidency and Hyderabad Circles, in a slightly higher ratio in the Mysore Circle, in a much lower ratio in the Burmah Circle, and in a slightly lower ratio at the Depôts and among the Troops on the March. The mortality from them was increased in the Mysore, Hyderabad, and Burmah Circles, and at the Depôts, and reduced in the Presidency Circle and among the Troops on the March. Omitting the Depôts, and the Troops on the March, both the admissions and the deaths were in greatly the highest ratio in the Hyderabad Circle. Dysentery was the most prevalent, and hepatitis was the most fatal disease of the order, diarrhœa and dyspepsia being next to dysentery in point of prevalence.

The following Table shows the prevalence of each of these diseases, and the mortality caused by it in each of the Circles. The statistics of dyspepsia have been kept separate, as they, as a rule, represent the effects of intemperance rather than those of climate.

Circles.	Ratio per 1,000 of the Strength.											
	Presidency.		Mysore.		Hyderabad.		Burmah.		Depôts.		Troops on the March.	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died	Admitted.	Died.
Dysentery	41·2	·90	77·0	1·48	120·7	4·09	68·8	·51	84·3	...	143·4	7·17
Diarrhœa...	65·2	...	72·9	...	116·8	...	35·4	·51	97·6	2·22	57·4	...
Hepatitis, including Hepatic Abscess...	60·2	2·71	54·4	2·59	45·2	4·16	61·7	2·53	102·0	11·09	43·0	7·16
Total	166·6	3·61	204·3	4·07	282·7	9·15	165·9	3·55	283·9	13·31	243·8	14·33
Dyspepsia	105·9	...	91·4	...	59·9	...	40·4	...	204·0	...	14·3	...

The lowest ratios are furnished by the Burmah Circle, but it must be borne in mind that a large number of invalids are transferred by the monthly steamers from it to the depôt at Poonamallee, and that a considerable proportion of the men so transferred die there, and are accounted for in the Depôt Returns. The comparative prevalence and fatality of dysentery, diarrhœa, and hepatitis, including abscess of the liver, at the principal stations in the Command during 1871 and 1872, are shown in the following Table :—

Stations.	Ratio per 1,000 of Strength.			
	1872.		1871.	
	Admitted for Dysentery, Diarrhœa, and Hepatitis, including Abscess of Liver.	Died from these Diseases.	Admitted for Dysentery, Diarrhœa, and Hepatitis, including Abscess of Liver.	Died from these Diseases.
Fort St. George	137·2	4·34	111·7	6·49
St. Thomas's Mount ..	198·5	14·29	214·4	5·16
Trichinopoly	215·4	3·21	157·3	14·08
Bangalore	152·6	3·39	102·9	1·27
Cannanore	309·0	4·01	307·3	7·01
Bellary	157·4	..	116·1	1·18
Secunderabad	340·0	11·33	287·7	12·20
Kamptee	145·1	4·00	84·9	..
Rangoon	180·5	4·75	265·8	4·97
Thayetmyo	85·4	1·78	296·8	..
Tonghoo	239·2	4·31	174·6	..
Port Blair	154·5	..	136·4	9·09

There was an increase in the ratio of admissions at Fort St. George, Trichinopoly, Bangalore, Bellary, Secunderabad, Kamptee, Tonghoo, and Port Blair, and a reduction at St. Thomas's Mount, Rangoon, and Thayetmyo. The lowest ratio was furnished by the latter station, which furnished the highest except one in 1871, and the highest ratio by Secunderabod. The highest ratio of deaths was at St. Thomas's Mount, where, however, the force was small; and after Bellary and Port Blair, at which there were no deaths from these diseases, the lowest ratio was at Thayetmyo.

Diseases of the Urinary System were less prevalent than in 1871 in the Mysore, Hyderabad, and Burmah Circles, at the Depôts, and among the troops on the march, and more so in the Presidency Circle. The increase in the latter was due to the prevalence of gonorrhœa and its sequelæ, chiefly in the 48th Regiment, at Bellary; and the reduction in the other Circles was confined, in a great measure, to the same affections.

Conditions, &c.—The admissions for *debility* were in a greatly reduced ratio in the Presidency and Burmah Circles, and at the Depôts, and among the Troops on the March, but in a higher ratio in the Mysore and Hyderabad Circles. In these the admissions occurred chiefly in the 1st Battalion of the 21st, the 76th, and the 89th Regiments.

Poisons.—The admissions under this head were in a greatly lower ratio than during the preceding year in all the Circles, the reduction, except in the Hyderabad Circle, being equal to more than the half of the ratio for 1871. With one exception—a case of poisoning by Jatropha Curcas in the 76th Regiment at Secunderabad—all the admissions were for delirium tremens, the prevalence of which in the several Circles in 1871 and 1872 is shown in the following Table:—

Circle.	Admitted for Delirium Tremens.	Died.	Ratio per 1,000 of Strength.			
			1872.		1871.	
			Admitted.	Died.	Admitted.	Died.
Presidency	11	..	5·0	..	14·6	·69
Mysore	13	1	4·8	·37	7·9	·59
Hyderabad	18	1	5·0	·28	6·4	·32
Burmah	6	2	3·0	1·01	14·2	1·09
Depôts	2	..	4·4	..	..	..
On the March	2	..	7·2	..	..	..

Madras. The sickness and mortality in the several corps serving in the Command during the year are shown in the following Table :—

Regiments.	Average Annual Strength.	Admitted into Hospital.	Deaths. In India.	Deaths. Of Invalids.	Deaths. Total.	Annual Ratio per 1,000. Admitted.	Annual Ratio per 1,000. Died.	Stations during the Year. (Batt. / Months.)
CAVALRY.								Months.
16th Lancers ..	466	709	18	..	18	1589·7	40·36	Secunderabad 12
18th Hussars ..	459	561	11	..	11	1222·2	23·95	On march 1/3 Bangalore 11 2/3
Total Cavalry ..	925	1,270	29	..	29	1373·0	31·35	
RL. ARTILLERY.								Batt. Months.
D Brigade R.H.A.	306	544	7	..	7	1777·6	22·87	A, On march 2/3 Trimulgherry 10 B, Bangalore 10 1/2 Embkd. for Engld.
5th Brigade R.A.	561	856	10	1	11	1525·8	19·61	No. 1, Cannanore 12 No. 2, Rangoon 12 No. 4, Tonghoo 12 No. 5, Rangoon 1/3 On voyage and on march .. 1 Secunderabad 10 2/3 No. 6, Rangoon 12 No. 7, Madras 12
6th „ „	85	150	2	..	2	1764·7	23·53	Secunderabad 1 1/3 On march 2/3 St. Thomas's Mount .. 10
9th „ „	468	742	7	..	7	1585·5	14·96	A, (late A Batt. 20th Brigade) St. Thomas's Mount .. 11 1/2 On march 1/2 C, Kamptee 10 1/2 On march 1 1/2 G, Trimulgherry 10 1/3 On march & in camp .. 1 2/3
18th „ „	138	185	1	..	1	1340·6	7·25	G, (late C Batt. 23rd Brigade) Bellary .. 12
20th „ „	1,053	1,537	25	2	27	1459·6	25·64	A, (late A Batt. 23rd Brigade) St. Thomas's Mount .. 12 B, Trichinopoly 12 C, Trimulgherry 11 2/3 On march 1/3 D, Kamptee 12 E, Bangalore 12 F, (late B Batt. 23rd Brigade) Thayetmyo 12 G, (late C Batt. 23rd Brigade) Bangalore .. 10 1/3 On march 1 2/3
Total Rl. Artillery	2,611	4,014	52	3	55	1537·3	19·91	

Regiments.	Average Annual Strength.	Admitted into Hospital.	Deaths. In India.	Deaths. Of Invalids.	Deaths. Total.	Annual Ratio per 1,000. Admitted.	Annual Ratio per 1,000. Died.	Stations during the Year. Months.
INFANTRY.								
2nd Bn. 10th Foot	778	681	10	2	12	875·3	15·42	Rangoon 12
1st „ 21st „ ..	950	960	14	1	15	1010·5	19·28	Bangalore 11½ Fort St. George ½
2nd „ 21st „ ..	843	1,408	14	1	15	1670·2	17·79	Thayetmyo ½ On march ½ Fort St. George 10 On march to Bombay .. ½
2nd „ 24th „ ..	820	822	20	1	21	1002·4	25·61	Trimulgherry 10½ On march to Bombay .. 1
43rd Foot ..	147	232	5	..	5	1578·2	34·01	Arrived from England. Cannanore 2
44th „ ..	778	1,550	17	..	17	1992·3	21·85	Kamptee, with Det. at Seetabuldee 12
45th Right Wing	551	558	7	1	17	1012·7	18·48	Madras 1 On march ½ Thayetmyo 10½
45th Left Wing	369	355	9			962·1		Madras ½ On march ½ Tonghoo 11½
48th Foot ..	765	900	5	..	5	1176·5	6·53	Arrived from Malta. Bellary 10
67th „ ..	78	65	..	..	..	833·3	..	Arrived from England. Rangoon and Port Blair .. ½
76th „ ..	912	1,326	22	2	24	1453·9	26·31	Secunderabad 12
89th „ ..	899	1,039	10	..	10	1155·7	11·12	Cannanore 10 On march 1 Bangalore 1
107th „ ..	70	57	2	..	2	814·3	28·57	Arrived from Bengal. On march 1
Total Infantry..	7,960	9,953	135	8	143	1250·4	17·96	

The ratio of admissions was highest in the Artillery, and lowest in the Infantry. That of deaths was lowest in the Infantry, and highest in the Cavalry, in which, however, it was less by nearly two-fifths than in 1871, the epidemic of cholera in the 18th Hussars in that year having raised it greatly above the average. The two Cavalry regiments having exchanged stations at the end of that year, the 16th Lancers, stationed at Secunderabad, and occupying the condemned infantry barracks there, now furnishes by much the highest ratio of admissions and deaths. Twelve deaths occurred in it from dysentery and hepatitis, and three from sunstroke.

In the Artillery the highest ratio of admissions was furnished by the D Brigade Royal Horse Artillery at Bangalore and Secunderabad, and the lowest by G Battery of the 18th Brigade Royal Artillery at Bellary, in which also the ratio of deaths was lowest. The ratio of deaths was highest in the 20th Brigade Royal Artillery.

In the Infantry, the 44th Regiment, stationed at Kamptee and Seetabuldee, furnished the highest ratio of admissions, and the 2nd Battalion of the 10th Regiment, at Rangoon, the lowest. The excess in the former was due chiefly

Madras.

to the prevalence of ardent fevers during the hot season, and of paroxysmal fevers during and after the rains.

Omitting the 43rd and 107th Regiments, which arrived in the Command at the end of the year, the ratio of deaths was highest in the 76th Regiment at Secunderabad, in which dysentery and abscess of the liver were the most fatal diseases, and lowest in the 48th Regiment, at Bellary. In the latter corps it was considerably below the average for the United Kingdom.

SANITARY REPORT.

Inspector-General Currie, C.B., in his Sanitary Report for 1872, remarks:—

The year under report may be considered to have been an average one as regards the health of the troops serving in the Madras Command, and it was exempt from cholera or other severe diseases in epidemic form.

Dengue, imported from Aden in the beginning of the year, was the only disease that prevailed epidemically, and affected the troops at the Presidency Stations and in Burmah more especially.

The admissions from dengue amounted to 917. No deaths resulted from it.

I shall now proceed to consider by Circles the sanitary condition of the barrack and hospital accommodation, the state of the water supply, drainage, conservancy, and any other influences bearing upon the health and comfort of the troops, and the improvements required.

Before doing so, I may explain that, with a view to removing the anomaly and inconvenience arising from Circles of medical superintendence not being conterminous with military commands, some changes were made in the Presidency and Mysore Circles in the beginning of this year. Thus Wellington, which is in the Bangalore Divisional Command, was transferred from the Presidency to the Mysore Medical Circle, and Bellary, with its appendage Ramandroog, in the "Ceded Districts." to the Presidency Circle. The latter now comprises the stations in the "Presidency," "Southern" and "Ceded Districts" Military Commands, and the Mysore Medical Circle, those in the Bangalore Division and in the Malabar Coast Command.

The number of troops in the two circles of medical superintendence is pretty nearly equal.

Presidency Circle (annual strength of the troops, 2,379) comprises the following stations: Fort St. George, St. Thomas's Mount, Poonamallee, Palaveram, Trichinopoly, Bellary and Ramandroog.

The barracks in Fort St. George, Madras, as described in last annual report, continue in good sanitary condition, and, though a change of troops has taken place in the commencement of the year, there has been no overcrowding. The barrack accommodation at St. Thomas's Mount has undergone no change during the year. The lofty double-storied barracks, which are being constructed for the two field batteries in the fine open site overlooking the Palaveram plain, are not yet ready for occupation, but they are now in a forward state.

Poonamallee—(average strength, 147).—The barracks here, as is well known, are old and bad, and they are not susceptible of being improved, to any extent beyond what has been already done, in the way of increased ventilation. But notwithstanding the disadvantages of very inferior barrack accommodation, and of too great distance from the sea for a marine sanitarium, the locality is eminently healthy, and well selected cases of disease derive great benefit from residence there. Convalescents requiring change are sent to this depôt from every station in the Presidency, including Burmah; and besides being valuable as a sanitarium, Poonamallee is a convenient depôt for invalids, and especially for those sent here from Burmah.

Trichinopoly—(average strength, 311).—The troops stationed here consist of two companies of Infantry and a Field Battery of Artillery. The barrack accommodation for this small force is good and sufficient.

Bellary.—The head-quarters of the "Ceded Districts" Command. The troops consist of a Field Battery and a regiment of Infantry (average

strength, 795). The Artillery barracks are single-storied, built on a well-raised plinth, high roofed, varandahs on both sides single and open, ventilation good and accommodation ample. The Infantry barracks are likewise single storied, but they differ from the Artillery in being flat-roofed and having double verandahs. The barracks at this station were built before dining and recreation rooms were introduced, and, as was the fashion then, one of the inner verandahs was allotted for the men to sleep in, and the other to dine in. On the whole, I consider the barrack accommodation at Bellary very fair, but it is barely sufficient for a strong regiment; an additional block has, therefore, been sanctioned to meet the deficiency. For several years past the troops stationed here have been remarkably free from severe climatic disease, and the mortality has been strikingly low. *Madras.*

Ramandroog.—This small hill sanitarium, from the excellence of its climate and proximity (38 miles) to Bellary, is of great value to the troops at that station, and the advantages that convalescents derive from the change may, in some degree, account for the low rate of mortality at Bellary. The permanent barrack accommodation is only for 70, but this can be supplemented by tents during the dry, hot months from March to June.

Hospitals.

The hospital accommodation in the Presidency Circle is generally good, and sufficient for all requirements. The hospitals at Madras, St. Thomas's Mount and Bellary, are double-storied, while those at the smaller stations are single.

Water Supply.

No change has been made in the mode of supply, and no scarcity has been experienced at any of the stations in the course of the year. In last year's report, I mentioned that waterworks on a large scale were being constructed by the Municipality of Madras, for supplying the native town and European settlements with wholesome water from the Red Hills Lake, 10 miles off. These works have lately been completed, and the inhabitants of every district of Madras now enjoy an abundant supply of good water, but the troops in Fort St. George are supplied, as heretofore, with water of excellent quality laid on from the seven wells. It will be interesting to note the effect of the improved water supply upon the public health of Madras. Since Calcutta and Bombay have enjoyed similar advantages, the improvement in the sanitary condition of these two large towns has been very remarkable.

Latrines.

At nearly all the stations in this Circle, the latrines have been adapted to the dry-earth system of conservancy, and where the conversion of existing latrines has not yet been made, a modification of the dry-earth system is carried out.

Baths, Lavatories, &c.

Baths and lavatories are provided on a liberal scale, and I have every reason for believing that they are generally in a satisfactory state.

Mysore Circle.—Bangalore.—The European troops here (average strength, 1,770) consist of one Cavalry and one Infantry regiment, Head-Quarters of a Brigade, and one troop, of Horse Artillery, and two Field Batteries.

The general health of the troops has been good. Enteric fever has prevailed to some extent, but this will be referred to hereafter, in connection with the drainage.

Barrack accommodation.

The barracks at Bangalore are single storied, and as a rule are fairly good. Though no structural changes of any importance have been made in any of them since last annual report, it is right to mention that a fine school-house has lately been built in the lines of the Infantry regiment.

Hospitals.

The Artillery and Cavalry hospitals consist of two large double-storied buildings, on a fine, open site in the old Race-course and freely exposed to every breeze. These hospitals are magnificent buildings, and, in their construction, every sanitary requirement appears to be provided for. Each hospital is capable of accommodating 72 sick, and there are two detached buildings for contagious diseases. The garrison female hospital, lately erected in the same locality, is also a large double-storied building, and is well adapted for the reception of lying-in-women, and all the sick women and children of the garrison. The Infantry hospital, on the other hand, is an old and very inferior description of building in a confined situation close to the barracks.

The accommodation afforded by the two magnificent pavilions allotted to the Artillery and Cavalry, being far in excess of their requirements, it has been proposed to erect a third smaller pavilion, and the three blocks will provide

Madras. ample hospital accommodation for the sick of the entire garrison. This proposition has been approved by Government, and the old Infantry hospital will eventually be abandoned.

Water Supply. The water supply has long been a subject of much interest here. The Dhobie's well-water is exceedingly pure, but as the supply from this source alone is insufficient for every purpose, especially during the dry season, it is now supplemented by water from the neighbouring Ulsoor Lake, which, after passing through filtering beds, is collected in the adjoining clear-water tank, and there mixed with water pumped direct from the Dhobie's well close by. This mixed water has been pronounced by competent chemical authority sufficiently pure for every purpose, and is thence distributed by pipes to the different regimental Lines. I may add, that, with view of increasing the yield of water from the Dhobie's wells, several additional wells are now being sunk, and if these prove successful, they will furnish valuable means of alternation, and the troops will then be plentifully supplied with water of unexceptionable quality.

Baths, Lavatories, &c. The ablutionary arrangements are very good.

Latrines. In the course of the year, the latrines have been improved, and adapted to the dry-earth system of conservancy.

Drainage. The drainage is not in a satisfactory state in some situations. Complaints have repeatedly been made of the want of proper surface drainage in the vicinity of the Cavalry and Artillery barracks in the old Race-course, and the drainage of the Infantry Lines is also defective. My visit to Bangalore having taken place in the dry season, I was not able to judge for myself of the actual state of the drainage, but there is no doubt of the fact that the cantonment stands much in need of a more effective system. Bangalore, otherwise a very healthy station, has been somewhat notorious of late years for the prevalence of enteric fever, and a larger number of cases have been returned in the last, than in any previous year. In 1872, 24 cases of enteric fever occurred, and they were distributed over every corps in the garrison. The origin or cause of enteric fever at this station is certainly not very apparent. The water supply has been the suspected agent, but the disease can scarcely be attributed to the quality of the water now used, for 17 out of the 24 cases alluded to, occurred during the first six months of the year, when Dhobie's well water (unmixed) was exclusively used by the troops.

Wellington.—(Average strength of the Depôt during the year, 282.) This sanatarium continues to maintain a high reputation for the maintenance and recovery of health, and it is largely utilized for both these purposes. In the course of last season, besides ordinary convalescents requiring change of climate, 150 growing lads, lately arived in the country, were sent to the Neilgherry Sanitarium, to pass the hot season, and some of these were selected to remain there during the cold weather, after which they rejoined their corps in the plains, vastly improved in physical condition from their sojourn in the hills. The aggregate number at Wellington during the year was 572. Of this number three died, and 27 were invalided to England. The strength of the women was 52, and that of the children 120. By arrangements which have been made this year, the accommodation for single men has been increased to nearly 525, including a portion of Non-commissioned Officers to carry on the drill and discipline of the young soldiers. The accommodation for married men is equal to 107 families. The climate of the Neilgherries is well suited to children, the cold weather is not severe, and the heat of summer is moderate and genial. The water supply is abundant, and of excellent quality.

Barracks. *Cannanore*—(Average strength, 746.) The barracks here have undergone no change during the year under report. The troops, during the year, consisted of a garrison battery of Artillery, and the 89th Regiment until the 2nd November, when this corps was relieved by the arrival of the 43rd Light Infantry direct from England. The 89th had been very healthy during the last 10 months, and the 43rd arrived in a good state of health, but, almost immediately after landing, mild bowel complaints began to prevail, and on the 20th December cases of enteric fever appeared, and, from that date to the end of the year, 15 cases had occurred, of which three proved fatal. There was no suspicion of the disease having

been imported; the regiment was healthy on the voyage out, and there was no history of enteric fever in the corps during the last two years of home service. The medical history of Cannanore shows, that although a few cases of enteric fever were recorded between the years 1862 and 1870, it was only subsequent to the arrival of the 89th Regiment from England, in October 1870, that the disease prevailed to any extent. Since then, four cases have occurred in 1870, 12 in 1871, and 16 in 1872. In consequence of the severe outbreak of enteric fever in the 43rd Regiment, Deputy Inspector-General Massy, C.B., was directed, early in January, to proceed to Cannanore to investigate and report upon the cause of the disease then prevailing. Adverting in the first place to the character of the barrack accommodation, Dr. Massy states that the Infantry barracks are built upon a nearly level plateau of laterite formation, at a distance varying from 100 to 200 yards from the low cliffs overhanging the sea. *Madras.*

The position is an admirable one, but its natural advantages have been seriously interfered with by the bad arrangements of the buildings. The barracks were built in 1812, and are constructed in the form of a square closed at the corners, having one narrow passage only in each face. Outside this square, numerous buildings have, from time to time, sprung up, forming almost another square, and materially hindering the currents of air reaching the barracks from any quarter. With regard to construction, the barracks are built upon a low plinth, the rooms are of great length, the floors boarded, and the roofs tiled. Though of no great height or width they are fairly ventilated, and cannot be condemned as barrack rooms. Besides those forming the square, there is a new range of barracks built on the south side, of a wider and loftier description.

The hospital accommodation is fairly good, and sufficient to meet requirements. Hospital.

The water supply is derived exclusively from wells, that for drinking purposes is obtained from two wells sunk in laterite rock close to the barracks, and the water is reported by the analyst of potable waters to be very pure, and remarkably free from organic and mineral impurities. Water Supply.

These are badly constructed and objectionably situated, and they have not been converted to the dry-earth system of conservancy. Latrines.

The drains are partly open and partly covered, and are not in a good state. Drainage.

Dr. Massy reports that the following are the most prominent hygienic defects at Cannanore.

"We have barracks built in the form of a square, closed at the corners.
"We have large latrines of a very objectionable construction placed between
"them and the prevailing winds. We have sewers untrapped and badly
"ventilated, running through the barrack enclosure, and we have a most
"filthy crowded native village, without the least attempt at conservancy, quite
"close to the barracks."

From this description it is obvious that the sanitary condition of the barracks, and their surroundings, cannot be considered satisfactory.

The more important of the recommendations comprised—the removal of some of the air-obstructing buildings outside the barracks; the improvement of the latrines, and introduction of the dry-earth system of conservancy; ventilation and improvement of drains, and their deodorization with carbolic acid from time to time; the walls of the barrack rooms to be scraped and washed with carbolized lime-water; and it was further reccommended that the independent village of Burnacherry should be placed under municipal control, with a view to ensuring its sanitary improvement. The prevalence of enteric fever has been confined to the Head-Quarters of the 43rd at Cannanore; the two companies stationed at Calicut and Malliapooram have not had a single case, neither has the garrison battery of Artillery suffered from it. As has been the case with nearly every regiment that has come out to India of late years, a considerable proportion of the men of the 43rd are very young soldiers, and many of them are weak and immature in constitution. Of this class, 125 were selected and sent to Wellington for the hot season, as it is well known that young soldiers are more liable to suffer from enteric fever than men of maturer years. On carefully considering all these circumstances connected with Cannanore, it is

Madras. hard to say whether the prevalence of enteric fever there of late years may be attributed to local insanitary conditions, or to the influence of tropical climate acting upon an unusually large number of unacclimatized constitutions. Possibly it may have resulted from the operation of both causes.

Hyderabad Circle.—Secunderabad.—The large force stationed here, averaging in strength 2,559, consists of a regiment of European Cavalry and a heavy battery of Artillery in the old part of the cantonment, the Head-Quarters of a Brigade, a battery of Horse Artillery, two Field Batteries of Artillery, and two regiments of Infantry in the new Cantonment at Trimulgherry. There has been a considerable amount of sickness here during the year; fevers, liver affections, and dysentery having been very prevalent; due, it has been alleged, to a very trying hot season, followed by an unusually heavy rainfall in the south-west monsoon. The 16th Lancers suffered severely from hepatic dysentery, a disease which has long been considered endemic in the old Infantry barracks, and occasionally attaining a fatal malignancy. The old Infantry barracks, occupied by the 16th Lancers, are in the form of a square; the rooms are long and somewhat narrow, with tiled roofs, and they have double verandahs. They are well ventilated, and there has been no overcrowding. The unhealthiness of these barracks has been attributed, and I believe justly, to their situation rather than to their defects of construction, aggravated in former years by overcrowding; 15 years ago, 1,000 men were quartered in these barracks. Fortunately, it will not be necessary to occupy these condemned barracks much longer. New Cavalry barracks are being built on the Bolaram plain, north of Trimulgherry, and two magnificent double-storied buildings are in a forward state, and will be ready for occupation by a wing of the regiment, in the course of this hot season. The new cantonment at Trimulgherry, for the Artillery and Infantry, is situated on high ground, about three miles north of Secunderabad. It may be stated, in general terms, that the Horse Artillery barracks (4) are magnificent double-storied buildings, the upper rooms being used as dormitories, and the lower as day rooms, &c. The verandahs above and below are single and open. The barracks for the Field Batteries are single-storied. In each block there are two dormitories, separated by a transept, extending across the centre of the building, forming a spacious dining and recreation room. The 2nd Infantry Barracks, as they are called, are nearly the same, in respect of plan, as those for the Field Batteries.

The barracks for the 1st Infantry Regiment are in the entrenched camp, and differ only in having double verandahs. The general character of the barrack accommodation at Trimulgherry is so good in every respect as to leave little to be desired. The subsidiary buildings, on the other hand, are not so perfect or complete as they might be, but their improvement and completion is merely a matter of time and money.

Hospitals. The Artillery hospital has not yet been built, the sick are meanwhile accommodated in one of the large double-storied barracks. There is only one hospital for the sick of the two Infantry regiments, an upper storied building; the accommodation is good as far as it goes, but it is barely sufficient when the sick lists are heavy.

Latrines. The latrines are on the modified dry-earth system.

Baths and Lavatories. The bath and ablutionary accommodation is fairly good.

Drainage. At Trimulgherry the drainage has never been systematically carried out. This is one of the works which has yet to be taken in hand, when funds are available.

Water Supply. The Cavalry regiment, occupying the old barracks at Secunderabad, is supplied with water, reported to be of good quality, from a large well of comparatively recent construction, at the foot of a low range of hills some distance from the barracks. The troops quartered at Trimulgherry are at present supplied with water, procured from wells in the lines, which is reported to be of good quality, but this supply will shortly be superseded by two large wells 50 feet in diameter, which have lately been made at a considerable distance from Trimulgherry. These wells are distinguished as the 1st and 2nd water supply, and are to be worked by steam pumps, the water to be stored

in reservoirs and brought to the barracks by pipes, which were being laid down at the time of my inspection in December last. The supply from these two sources will, it is calculated, be sufficient for the whole of the troops at Trimulgherry and the Cavalry regiment on the Bolaram plain. *Madras.*

The articles composing the soldiers' rations are the same at this station as elsewhere in the Presidency, but, in consequence of the mutton being unusually poor and devoid of nutriment during the hot, and beginning of the rainy, seasons, it has been recommended to discontinue its issue this year during those months, and to restrict the meat ration entirely to beef, which is always of fair quality. Rations.

The vegetable ration too has long been complained of at Secunderabad, for, during some months of the year, fresh potatoes are not procurable, and though the preserved potato has been substituted, soldiers generally dislike it.

I am glad to learn that a contract has been entered into this year, which will ensure a regular supply of fresh potatoes to the troops all the year round, and, in future, the difficulties which the Commissariat have had to encounter on this account will shortly be overcome by the opening of the Nizam State Railway.

Kamptee.—The force stationed here consists of two Field Batteries and a regiment of Infantry (average strength, 999). This station has always been noted for the prevalence of malarious fever, but not of a malignant type. During the last 12 months the 44th Regiment, fresh from England, has had 850 admissions from fever, chiefly of the intermittent type, out of a total of 1,550 admissions from all causes; and the Artillery has suffered in nearly the same proportion.

Those of the Field Batteries consist of two blocks placed back to back, communicating freely by arches, and the whole is surrounded by enclosed verandahs. By this insanitary arrangement, four rows of beds are placed in an atmosphere which must, necessarily, be more or less stagnant and impure, and all the more so, from the barracks being placed end on to the prevailing wind. The barracks, formerly occupied by Horse Artillery, are in the form of a square, and, though inferior, they are not so objectionable. The Infantry barracks consist of 10 long ranges with a single enclosed verandah all round. The accommodation is indifferent, but the main objection to the barracks consists in their being placed on low ground along the bank of the "Kanhan" river (a small stream except during the rains), and with end on to the prevailing wind, which blows over an extensive swampy plain, the supposed source of local malaria. From original defects of construction and bad position, such as I have now described, the sanitary condition of the barracks at Kamptee is not susceptible of improvement, and on these grounds it has been proposed to build new barracks on a slightly elevated ridge, about a mile to the west of the present station, and to windward of the swampy ground alluded to, but at present there is little probability of this proposition being carried out. Barracks.

The Artillery hospital on the whole is good, but the Infantry one is badly planned, and the accommodation is insufficient for the number of sick during the aguish months. Hospitals.

The subsidiary buildings are generally good, especially the ablution rooms, which are furnished with fixed copper basins, with water laid on, and there are small bath rooms adjoining for private ablutions. There are also large swimming baths in the lines. The latrines are on the modified dry-earth system. Latrines, Cook houses, Baths, Lavatories, &c.

A plentiful supply of water, reported to be of good quality, is procured from wells in the lines. One well has been covered and fitted with a pump, and the water drawn from it passes through a filtering bed; but, from insufficient means of working the pump and keeping the filter full, the quantity of water obtained is somewhat limited. Water Supply.

Seetabuldee.—This small hill fort commands the large town of Nagpore, which is about ten miles from Kamptee. At the upper fort, an excellent new barrack and hospital have lately been built, sufficient to accommodate a detachment of 40 or 50 men.

Burmah Circle.—This Circle comprises the following stations: Rangoon, Thayetmyo, Tonghoo, and Port Blair in the Andamans. The average strength

Madras. of the British troops serving in Burmah during the year has been 1,978; and all the stations have been remarkably healthy, dengue having been the only disease of an epidemic character.

Barracks. The barracks are all built on one plan, and are constructed of *teak*, raised on piles 6 or 8 feet from the ground. At all the stations, the barracks are commodious and well ventilated. In my last sanitary report, I mentioned that the Infantry barracks at Rangoon had been built 17 years, and, through age, were becoming insecure. Since then, new barracks have been sanctioned for the Infantry, and a commencement has been made, inasmuch as three of the old barracks have been removed, and the ridge on which they stood is being lowered, &c. A site for a new Artillery barrack has also been marked out. This additional barrack is necessary in consequence of the Artillery having been increased from one to two batteries. At Thayetmyo and Tonghoo, the barrack accommodation is ample and very good, and the same is the case at Port Blair.

Hospitals. At Rangoon the Hospitals are fairly good and on well raised situations. At Thayetmyo and Tonghoo, ordinary barrack blocks are utilized as hospitals for the Infantry. In June last, a new Artillery hospital was opened at Thayetmyo, which is described by the Medical Officer in charge as a palatial double-storied building.

Baths, Lavatories, Latrines, &c. The condition of the arrangements for ablution is favourably reported upon at all the stations.

Rations. Mutton is scarce, and beef constitutes the regular meat ration, except for two days of the month, when salt pork, or beef with pickles, is issued, a change which is much relished by the men. Mutton is issued to the sick in hospital every alternate day. Vegetables are almost always scarce in Burmah, and potatoes, imported from Calcutta and Madras, are necessarily very expensive.

Water Supply. The water supply is good at all stations, and is obtained from wells for drinking purposes. At Rangoon, the supply is sometimes rather scanty for a few weeks before the rains set in.

Cooking. *General Remarks.*—No change to report in the construction of barrack kitchens, or mode of cooking.

Canteens. The liquors suplied are generally good, but it is remarked at many stations that porter keeps better than beer, the latter too often showing a tendency to become sour. This fact I myself had several opportunities of verifying, in the course of my tour of inspection last cold season. In addition to canteens, groceries and other provisions are now generally, I believe, imported from England regimentally, and sold at cheaper rates to married and single. A well-conducted refreshment-room cannot fail to be a source of comfort to the soldier in this country.

Clothing. No change has been made in the clothing of the soldier in India during the year.

The clothing now supplied is suitable to the climate, and I believe it gives satisfaction.

Bedding. No change to report.

Duties. These are everywhere spoken of as light, and in no way injurious to health.

Amusements. In and out-of-door amusements are now provided for, more or less, at every station.

Intemperance. The prevalence of the vice of intemperance varies at different stations, and is mainly influenced by local facilities for obtaining liquor. Since the term ebriositas was expunged from the statistical nomenclature, under which all admissions from the minor effects of intemperance were returned it is impossible to estimate with anything like accuracy the effects of this vice upon the sickness and invaliding of the army. As far as I can learn from regimental reports, the system of fines does not appear to be attended with much success. The prohibition of the sale of spirits at hill sanitaria, and the substitution of malt liquor, appears to be an excellent regulation, and, judging from the short experience of the working of this new system at Wellington, the result has been encouraging.

III.—Bombay

Bombay.

The average strength of the European troops serving in the Bombay Command in 1872 was 10,898; the admissions into hospital among them were 16,973; and the deaths, including 10 of invalids at Netley or on the passage home, amounted to 215. The ratios per 1,000 of the strength represented by these numbers are, for admissions, 1557·4, and for deaths, 19·72, each considerably above the corresponding ratio for the preceding year.

The following Table, framed from Abstract No. 19 in the Appendix, shows the admissions and deaths from each class and order of diseases:—

Order.	Diseases.	Strength, 10,898.				Ratio per 1,000 of Mean Strength.			
			Deaths.			1872.		1869-71.	
		Admissions.	In India.	Of Invalids.	Total.	Admitted.	Died.	Admitted.	Died.
	I. *General Diseases.*								
1	Febrile Group ..	9,159	70	..	70	840·4	6·42	715·5	5·45
2	Constitutional „ ..	1,386	25	4	29	127·2	2·66	160·3	2·41
	II. *Local Diseases.*								
	Diseases of the—								
1	Nervous System ..	158	33	..	33	14·5	3·03	18·0	2·44
2	Eye	220	..	..	..	20·2	..	28·7	..
3	Ear	57	..	..	..	5·2	..	5·9	·03
4	Nose	·5	..	..	..	·5	..	·5	..
5	Circulatory System ..	93	11	1	12	8·5	1·10	14·9	1·16
6	Absorbent „ ..	195	..	..	..	17·9	..	22·5	..
8	Respiratory „ ..	373	7	1	8	34·2	·73	46·4	·75
9	Digestive „ ..	2,163	39	3	42	198·5	3·85	217·3	3·95
10	Urinary „ ..	915	2	1	3	84·0	·28	80·3	·31
11	Generative „ ..	95	..	..	..	8·7	..	11·3	..
12	Organs of Locomotion..	47	..	..	..	4·3	..	4·1	·06
13	Cellular Tissue.. ..	216	..	..	..	19·8	..	17·6	..
14	Cutaneous System ..	725	..	..	..	66·5	..	70·4	·03
	III. *Conditions, &c.*								
	Debility..	230	1	..	1	21·1	·09	12·4	..
	IV. *Poisons* ..	55	..	..	..	5·0	..	11·1	·50
	V. *Injuries.*								
2	Accidental	872	10	..	10	80·0	·92	82·3	·60
3	Homicidal	..	..	..	..	..	..	·2	·13
4	Self-inflicted	3	7	..	7	·3	·64	·2	·60
6	Judicial..	..	..	..	..	..	..	..	·09
	VI. *Surgical Operations.*	1	..	..	..	·1	..	·2	..
	No Appreciable Disease	5	..	..	..	·5	..	·3	..
	Total ..	16,973	205	10	215	1557·4	19·72	1520·4	18·51
	Average of 10 years, 1862-71	..	..	..	..	1461·2	20·38	..	..

Bombay. The admissions were considerably above, but the deaths were slightly below the average for the preceding ten years.

GENERAL DISEASES.—The excess in the ratio of admissions during the year was entirely the result of the prevalence of the febrile group of diseases of this class. The admissions for diseases of the constitutional group were less numerous than during the preceding year, and considerably below the average.

The following Table shows the amount of sickness and mortality caused by the principal diseases of this class:—

General Diseases.	Admitted.	Died.	Ratio per 1,000 of Strength. 1872. Admitted.	1872. Died.	1869–71. Admitted.	1869–71. Died.
Febrile—						
Eruptive Fevers	57	2	5·2	·18	·8	·03
Continued „	3,636	29	333·6	2·66	150·6	1·76
Paroxysmal „	5,406	4	496·1	·37	559·0	1·78
Malignant Cholera	42	33	3·9	3·03	2·6	1·76
Influenza	7	..	·6	..	·8	..
Erysipelas	8	1	·7	·09	·8	..
Choleraic Diarrhœa	..	..	..	..	·3	·03
Other Diseases of this group ..	3	1	·3	·09	·6	·09
Total	9,159	70	840·4	6·42	715·5	5·45
Constitutional—						
Rheumatism	463	..	42·5	..	42·0	·06
Syphilis	759	2	69·6	·18	93·8	·19
Scrofula, Phthisis, &c.	115	22	10·5	2·02	11·0	2·00
Scurvy and Purpura	4	1	·4	·09	·8	..
Anæmia	28	1	2·6	·09	11·6	·03
Other Diseases of this group ..	17	3	1·6	·28	1·1	·13
Total	1,386	29	127·2	2·66	160·3	2·41

Eruptive Fevers occasioned 57 admissions and 2 deaths, 13 of the admissions and both the deaths being from small-pox, 7 admissions from chicken-pox, 35 from measles, and 1 from scarlet fever. Eight of the admissions for small-pox and one of the deaths from that disease occurred in the 56th Regiment at Poona. The other fatal case occurred in the detachment of the 83rd Regiment at Sattara; and of the remaining admissions, 2 were in the 3rd Hussars, at Ahmednuggur, 1 in the Artillery, at Colaba, and 1 in the same corps at Ahmedabad. Of the 35 admissions for measles, 30 occurred in the beginning of January, in a detachment of the 1st Battalion of the 2nd Regiment landed at Vingorla, and *en route* for Belgaum. The Principal Medical Officer and the Regimental Surgeon are of opinion that all were in reality cases of "dengue," from which disease, then little known in Southern India, a detachment of Artillery landed from the same steamer, at Cannanore, suffered severely; but the spread of the disease brought by the infected party to Belgaum was confined entirely to the children of the regiment there. The solitary admission for scarlet fever was in the 49th Regiment at Mhow, where that disease was not prevalent at the time.

The ratio of admissions for *continued fevers* was nearly twice that for the preceding year, and more than twice the average for the preceding three years. The excess was due almost entirely to the great prevalence of "dengue," which had been introduced at Bombay towards the end of the

preceding year by vessels from Aden, and had established itself among the native population, although it had not extended to the troops. It had been introduced at Aden in the end of June 1871 by trading vessels from Zanzibar, where it was then prevalent, and had prevailed epidemically among the troops during the two following months, causing 222 admissions into hospital among the non-commissioned officers and men. Among the native population at Aden its prevalence had been much more universal, and much longer continued, and cases continued to occur sporadically among them until the occurrence of the outbreak among the troops in 1872 to be afterwards noted. During the first three months of 1872 a few sporadic cases were reported from time to time among the native population at Bombay, but the disease did not attack the European troops stationed there until the beginning of April. It then broke out among them in an epidemic form, and the attacks continued very numerous until June, after which month the epidemic rapidly declined. At Poona, where the prevalence of the disease is stated to have been greater than at any other station in the command, it began in the 83rd Regiment on the 10th of March, in the 68th on the 23rd, and in the 56th on the 24th, and it reached its maximum in April, after which it gradually declined, as the number of men unprotected by having passed through an attack became smaller, and it finally died out towards the end of November, by which time nearly every one in the station had suffered from it in a greater or less degree. In the 56th Regiment, in an average strength of 922 men, there were 397 admissions; in the 68th, in a strength of 655, 498 admissions; and in the 83rd, in a strength of 310, 59 admissions. Many additional cases appear to have been so slight as not to require hospital treatment. At Kirkee the period during which the disease prevailed, was nearly the same as at Poona, but its prevalence was not so universal. At Ahmedabad and Deesa it broke out in the beginning of June, and prevailed so extensively that few at either station escaped an attack. At Nusseerabad it did not appear till November, and then the attacks were both milder in character and fewer in proportion to the strength than at the other stations which have been named. At Kurrachee and Hydrabad in Scinde it was epidemic from October to December, but there also it prevailed in a milder form, and was less universal than at the stations where the epidemic occurred during the hot season. At Aden, as has been mentioned, a few cases continued to occur sporadically among the civil population from the termination of the epidemic of the previous year until April 1872, when the disease again broke out in an epidemic form among the European troops. It continued to prevail among them with unusual severity for several months, many of the cases in the 3rd Battalion of the 60th Rifles being complicated with urgent symptoms of impending insolation, the result, no doubt, of the extreme heat of the weather at the time. When the epidemic was at its height, these symptoms were so common that it was found necessary to maintain a strict watch over all fresh admissions, in order that the approach of the threatened danger might be detected in time. In the above-named battalion, of which the average strength was 563, there were 330 admissions for dengue. The total number of admissions for that disease in the command was 2,472 among the men, 63 among the officers, 202 among the women, and 296 among the children. The proportions per 1,000 of the strength, in the different classes represented by these numbers, are as follows:—men, 226·8, officers 142·2, women 156, children 130·9. So far as the women and children are concerned, however, these ratios do not represent nearly the whole prevalence of the disease, as the majority of the cases among them were treated in their quarters. Many of the slighter cases among the men also were treated without admission into hospital. Only one death from dengue is reported as having taken place among the men, and it appears to have been rather the result of alcoholic excess, the patient when convalescent having been supplied by his wife with a draught of spirits, the drinking of which was speedily followed by the occurrence of fatal head symptoms. One death occurred among the women in the 3rd battalion 60th Rifles at Aden, and 4 among the children, 1 in the same battalion, 1 in the 66th Regiment at Kurrachee, 1 in the 68th at Poona, and 1 in the 83rd at the same station. The extreme contagiousness of the disease was almost universally recognised by the Regimental Medical Officers,

Bombay.

Bombay. whose reports contain abundant evidence on that point, and its spread by fomites is noted by several of them.

From *simple continued fever* there were 706 admissions and 3 deaths, the former being less than half the number of admissions in 1871, and much below the average. From *febricula* there were 416 admissions, all, or nearly all, it may be assumed, being the result of intemperance. As most of those for *dyspepsia*, and, of course, all those for *delirium tremens* and *poisoning by alcohol*, are attributable to the same cause, it may be mentioned here that the admissions under these four heads give a ratio of 68·27 per 1,000 of the strength. From *enteric fever* the admissions and deaths were almost double those in 1871. The returns show 42 of the former and 25 of the latter; but it is obvious that the proportion of admissions must have been much greater, and many of the slighter cases were no doubt returned as simple continued fever. The Surgeon of the 59th Regiment mentions in his report on that corps, that several cases so returned by him "presented some of the characteristic signs of "enteric fever, but were not diagnosed as cases of that disease, chiefly on "account of the comparatively early subsidence of the graver symptoms."

Paroxysmal Fevers were rather less prevalent than during the preceding year, and considerably below the average; but they were, as usual, greatly the most frequent causes of admission to hospital. Only four deaths resulted from them, however, being scarcely a fifth of the usual mortality.

From *malignant cholera*, which was entirely absent from the returns for the preceding year, there were 42 admissions and 33 deaths, the proportions borne by these numbers to the strength being higher than the corresponding ratios for 7, and lower than those for 3 of the preceding 10 years.

The prevalence of *rheumatism* was exactly the same as in 1871, but in that of *syphilis* there was a large reduction, the admissions being fewer by 16·1 per 1,000 of the strength, and 24·2 below the average of the previous three years. The Principal Medical Officer attributes the reduction in a great measure to the effect of the lock hospitals at some of the stations where the disease was formerly most prevalent.

Scrofula and Phthisis were rather more prevalent and fatal than in 1871, but the ratios of admissions and deaths from them are almost identical with the average for the preceding 3 years. The admissions for *anæmia* were less than half as numerous as in 1871, and less than a fourth of the average.

Local Diseases.—The admissions for diseases of the *nervous system*, the *eye*, the *circulatory*, *absorbent*, and *respiratory* systems, were considerably less numerous in proportion to the strength than during the previous year, and there was no considerable increase in any order of this class. The mortality from diseases of the nervous system was, however, above the average, the excess being due to apoplexy and sunstroke.

From diseases of the *digestive* system, the most important order of the class, and that from which the greatest mortality always results, both the admissions and the deaths were slightly below the average.

Poisons.—The admissions under this head did not much exceed the half of those during the preceding year, and there were no deaths. Of the 55 admissions 44 were for delirium tremens, 9 for poisoning by alcohol, and 1 for poisoning by Indian hemp. In 1871 there were 67 admissions for delirium tremens, and 32 for poisoning by alcohol.

Injuries.—*Accidental Injuries* were fewer by 7·8 per 1,000 of the strength than during the preceding year, but the ratio of mortality from them was higher by ·55. Of the 10 accidental deaths, 6 were by drowning, 2 from concussion of the brain, 1 from multiple injury, and 1 from gunshot. There were 7 cases of *suicide*, 4 by rifleshot, 2 by cut-throat, and 1 by hanging.

The following Table shows the admissions and deaths at the principal stations in the Command:—

Military Divisions.	Stations.	Average Annual Strength.	Admitted into Hospital.	Died in Inns.	Ratio per 1,000.			
							Average of 9 Years.	
					Admitted.	Died.	Admitted.	Died.
Presidency ..	Colaba	446	841	11	1885·7	24·66	1389·1	17·79
Poona ..	Poona..	1,877	3,036	32	1617·5	17·05	1269·5	12·91
	Sattara.	184	125	2	679·4	10·87	1231·4	12·08
	Ahmednuggur ..	552	504	10	913·1	18·12	1385·1	11·27
	Asseerghur . ..	115	198	1	1721·8	8·70	1322·2	16·11
	Belgaum	1,034	686	6	663·4	5·80	1075·7	10·48
	Kirkee	415	553	..	1332·6	..	1414·3	11·76
Mhow ..	Mhow	1,396	2,123	17	1520·7	12·18	1733·6	14·02
	Indore	102	93	4	911·8	39·22	1554·3	12·70
	Neemuch	463	591	24	1276·5	51·84	2435·5	38·43
	Nusseerabad ..	650	1,409	17	2167·7	26·15	2038·3	32·87
Northern..	Deesa..	889	2,163	24	2433·1	27·00	1237·6	14·65
	Ahmedabad. ..	136	423	3	3110·3	22·06	2069·8	22·13
	Mount Aboo ..	122	312	3	2557·4	24·59	1729·4	17·59
Scinde ..	Kurrachee.. ..	768	1,264	14	1645·9	18·23	1495·6	13·79
	Hydrabad	375	671	11	1789·4	29·33	1207·1	13·79
	Aden	703	984	18	1399·7	25·61	1056·0	20·18
	Depôts Sanitaria & Invalids	52	38	5	730·8	96·15	..	..
	On the March, &c.	422	447	3	1056·7	7·09	1017·5	24·71

Compared with the results for 1871 there was an increase in the ratio of admissions at Colaba, Poona, Asseerghur, Kirkee, Deesa, Ahmedabad, Hydrabad, and Aden, and among the troops on the march; and a decrease at Sattara, Ahmednuggur, Belgaum, Mhow, Indore, Mount Aboo, Kurrachee, and the Depôts and Sanitaria. The ratio of deaths was higher than during the preceding year at Colaba, Poona, Ahmednuggur, Asseerghur, Mhow, Indore, Neemuch, Nusseerabad, Deesa, Mount Aboo, Kurrachee, Hydrabad, Aden, and the Depôts and Sanitaria; and lower at Sattara, Belgaum, Kirkee and Ahmedabad, and among the troops on the march. Compared with the average for the preceding 9 years, the ratio of admissions was in excess at Colaba, Poona, Ahmednuggur, Asseerghur, Nusseerabad, Deesa, Ahmedabad, Mount Aboo, Kurrachee, Hydrabad, and Aden, and reduced at all the other stations. The mortality was above the average of the same period at Colaba, Poona, Ahmednuggur, Indore, Neemuch, Deesa, Mount Aboo, Kurrachee, Hydrabad, and Aden, and below it at all the other stations.

The following Table shows the admissions and deaths from the different classes and orders of diseases in each of the military divisions :—

Order.	Military Divisions	Presidency.		Poona.		Mhow.		Northern.		Scinde.		Aden.		Troops on March		Presidency.		Poona.		Mhow.		Northern.		Scinde.		Aden.		Troops on March.	
	Average Annual Strength	446		4,177		2,611		1,147		1,144		703		423		Annual Ratio per 1,000 of Mean Strength.											
	Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
	I. *General Diseases.*																										
1	Febrile Group	464	4	2299	15	2279	37	2115	4	998	8	522	...	226	...	1040·4	8·97	550·4	3·59	872·9	14·17	1843·9	3·49	872·4	6·99	742·5	...	534·3	...
2	Constitutional ,,	78	...	487	9	468	6	107	9	88	1	47	...	43	...	174·9	...	116·6	2·15	179·2	2·30	93·3	7·85	76·9	·87	66·9	...	101·7	...
	II. *Local Diseases.*																										
	Diseases of the—																										
1	Nervous System	3	1	43	5	40	7	24	9	22	6	15	4	5	1	6·7	2·24	10·3	1·20	15·3	2·68	20·9	7·85	19·2	5·25	21·3	5·69	11·8	2·36
2	Eye	12	...	91	...	45	...	33	...	24	...	8	...	4	...	26·9	...	21·8	...	17·2	...	28·8	...	21·0	...	11·4	...	9·5	...
3	Ear	7	...	17	...	4	...	11	...	14	...	1	...	...	...	15·7	...	4·1	...	1·5	...	9·6	...	12·2	...	1·4	...	...	...
4	Nose	1	...	1	...	2	...	...	...	1	...	...	...	...	...	2·2	...	·2	...	·8	...	...	...	·9	...	...	...	...	...
5	Circulatory System	...	...	29	5	19	2	15	3	13	...	5	1	2	...	...	...	6·9	1·20	7·3	·77	13·1	2·62	11·4	...	7·1	1·42	4·7	...
6	Absorbent ,,	11	...	75	...	74	...	5	...	4	...	5	...	12	...	24·7	...	17·9	...	28·3	...	4·3	...	3·5	...	7·1	...	28·4	...
8	Respiratory ,,	35	...	136	1	81	2	51	1	34	1	18	1	10	...	78·5	...	32·6	·24	31·0	·77	44·5	·87	29·7	·87	25·6	1·42	23·6	...
9	Digestive ,,	95	5	714	13	402	7	255	2	341	5	185	6	52	...	213·0	11·21	170·9	3·11	154·0	2·68	222·3	1·74	298·1	4·37	263·2	8·54	122·9	...
10	Urinary ,,	33	...	415	1	247	...	72	1	64	...	45	...	21	...	74·0	...	99·4	·24	94·6	...	62·8	·87	55·9	...	64·0	...	49·6	...
11	Generative ,,	1	...	33	...	31	...	9	...	8	...	2	...	5	...	2·2	...	7·9	...	11·9	...	7·8	...	7·0	...	5·7	...	11·8	...
12	Organs of Locomotion	3	...	16	...	19	...	2	...	2	...	5	...	2	...	6·7	...	3·8	...	7·3	...	1·7	...	7·1	...	4·7	...	4·7	...
13	Cellular Tissue	13	...	81	...	30	...	22	...	25	...	13	...	8	...	29·2	...	19·4	...	11·5	...	19·2	...	21·9	...	18·5	...	18·9	...
14	Cutaneous system	23	...	283	...	196	...	55	...	131	...	32	...	14	...	51·6	...	67·8	...	75·1	...	48·0	...	114·5	...	45·5	...	33·1	...
	III. *Conditions, &c.*																										
	Debility	15	1	60	...	46	...	24	...	26	...	41	...	4	...	33·6	2·24	14·4	...	17·6	...	20·9	...	22·7	...	58·3	...	9·5	...
	IV. *Poisons*	3	...	7	...	16	...	11	...	15	...	3	...	...	...	6·7	...	1·7	...	6·1	...	9·6	...	13·1	...	4·3	...	...	...
	V. *Injuries.*																										
2	Accidental	44	...	312	1	216	...	87	...	119	1	35	5	39	2	98·7	...	74·7	·24	82·7	...	75·9	...	104·0	·87	49·8	7·11	92·2	4·73
3	Homicidal	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	Self-inflicted	...	...	2	1	...	1	...	1	1	3	...	1	...	...	...	...	·5	·24	...	·38	...	·87	·9	2·62	...	1·42	...	...
6	Judicial	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	VI. *Surgical Operations*	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	·2	...	·4	...	...	...	...	...	...	...	...	...
	No appreciable disease	...	...	...	...	...	...	...	...	5	...	...	...	...	...	...	...	...	...	...	...	...	...	4·4	...	...	...	...	...
	Total	841	11	5102	51	4216	62	2898	30	1935	25	984	18	447	3	1885·7	24·66	1221·5	12·21	1614·7	23·75	2526·6	26·16	1691·4	21·84	1399·7	25·60	1056·7	7·09

GENERAL DISEASES.—The ratio of admissions for diseases of the febrile group was nearly three times that for the preceding year in the Presidency Division, more than double in the Northern Division, and considerably increased in Scinde, at Aden, and among the troops on the march. It was considerably reduced in the Poona and Mhow Divisions.

The mortality from febrile diseases was increased in all the Divisions except that at Aden, in which, and among the troops on the march, there were no deaths from these diseases either in 1871 or in 1872. The ratio of admissions for diseases of the constitutional group was largely reduced in all the Divisions except the Presidency and Poona ones, in the former of which there was a considerable increase, and in the latter there was no change.

The following Table shows the admissions and deaths in each of the Divisions from the principal diseases of this class :—

Military Divisions	Presidency.		Poona.		Mhow.		Northern.		Scinde.		Aden.		Troops on the March.		Presidency.		Poona.		Mhow.		Northern.		Scinde.		Aden.		Troops on the March.	
Average Annual Strength	446		4,177		2,611		1,147		1,144		703		423		Annual Ratio per 1,000 of Mean Strength.													
GENERAL DISEASES.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Febrile—																												
Eruptive Fevers	1	...	19	2	2	...	1	...	1	...	...	...	30	...	2·2	...	4·5	·47	·7	...	·9	...	·9	...	...	...	70·9	...
Continued Fevers	298	2	1423	6	190	9	869	3	321	8	486	...	16	...	668·2	4·48	340·7	1·44	72·8	3·45	757·6	2·61	280·6	6·99	691·3	...	37·8	...
Paroxysmal Fevers	165	2	847	...	2048	1	1244	1	675	...	36	...	179	...	369·9	4·48	202·8	...	784·4	·38	1084·5	·87	590·0	...	51·2	...	423·2	...
Malignant Cholera	...	...	7	6	35	27	...	...	...	...	...	...	...	...	...	...	1·7	1·44	13·4	10·34	...	...	...	...	...	...	...	...
Influenza	...	...	1	...	...	...	...	...	...	...	...	...	1	...	...	...	·2	...	...	...	...	...	...	...	...	...	2·4	...
Erysipelas	...	...	2	1	4	...	1	...	...	...	...	...	...	...	...	...	·5	·24	1·5	...	·9	...	...	...	...	...	...	...
Other Diseases of this Group	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	·9	...	...	...	...	...
Total	464	4	2299	15	2279	37	2115	4	998	8	522	...	226	...	1040·3	8·96	550·4	3·59	872·8	14·17	1843·9	3·48	872·4	6·99	742·5	...	534·3	...
Constitutional—																												
Rheumatism	30	...	223	...	73	...	33	...	29	...	34	...	14	...	67·2	...	53·4	...	27·9	...	28·8	...	25·3	...	48·4	...	33·0	...
Syphilis	43	...	205	1	357	...	45	1	48	...	9	...	26	...	96·4	...	49·1	·24	136·7	...	39·2	·87	42·0	...	12·8	...	61·5	...
Scrofula, Phthisis, &c.	5	...	45	6	22	4	21	7	4	1	2	...	1	...	11·2	...	10·8	1·44	8·4	1·53	18·3	6·10	3·5	·87	2·8	...	2·4	...
Scurvy and Purpura	...	...	1	1	...	...	...	1	1	...	1	...	1	...	...	...	·2	·24	...	...	...	·87	·9	...	1·4	...	2·4	...
Anæmia	...	...	3	...	14	1	4	...	6	...	...	...	1	...	...	...	·7	...	5·4	·38	3·5	...	5·2	...	...	...	2·4	...
Other Diseases of this Group	...	...	10	1	2	1	4	...	...	...	1	...	...	...	...	...	2·4	·24	·8	·38	3·5	...	...	...	1·4	...	...	...
Total	78	...	487	9	468	6	107	9	88	1	47	...	43	...	174·8	...	116·6	2·16	179·2	2·29	93·3	7·84	76·9	·87	66·8	...	101·7	...

Continued Fevers were much more prevalent than during the preceding year in all the Divisions, the increase being greatest in the Presidency and Northern ones, in which the ratios of admissions for them were respectively more than ten times, and nearly four times those for 1871. The increase was almost entirely the result of the epidemic of dengue, of which an account has been given already. The admissions for that disease in the several Divisions, and their ratios per 1,000 of the strength, were as follows :-

Military Divisions.	Admissions.	
	Number.	Ratio per 1,000 of Strength.
Presidency	187	419·3
Poona	1,033	247·4
Mhow	56	21·4
Northern	616	537·1
Scinde	189	165·2
Aden	376	534·8

The remaining 15 admissions occurred in details on the march, &c., not included in the strength of any of the Divisions. The mortality from continued fevers was lower than during the preceding year in the Mhow Division, and at Aden there were no deaths from it either in 1871 or in 1872, but in all the other Divisions the mortality was considerably increased, the excess being generally the result of the increased prevalence of enteric fever. The admissions for *simple continued fever* were less than half the average, and only three cases of that disease proved fatal. In the 56th Regiment, at Poona, in which there were 746 admissions for it during the last nine months of 1871, the regiment having arrived from England on the 9th April, there were but 21 in 1872. This reduction, however, is not altogether to be put down to the effects of acclimatization in lessening the tendency to febrile attacks, as there was a large increase in the number of admissions for ague, and those for dengue, all of which occurred during the hot season, amounted to 397. But for the prevalence of these diseases there can be little doubt that the admissions for ardent fevers would have been more numerous.

Enteric Fever.—The prevalence and fatality of this disease, as has been mentioned, were almost twice as great as during the preceding year, the admissions for it having been 42, and the deaths from it 25. In 1871 they were respectively 22 and 14. With the exception of cholera alone, it was in 1872 the most fatal disease in the command. The following Tables, framed by Surgeon-General O'Flaherty, show the number of cases during each month of the year at each station at which any occurred, and the ages of the men who died of it.

Bombay.

Divisions.	Scinde.			Presidency.	Poona.			Northern.	Mhow.				Total.
Months.	Hydrabad.	Kurrachee.	Ghizree.	Bombay.	Poona.	Sattara.	Ahmednuggur.	Deesa.	Indore.	Neemuch.	Nusseerabad.	Tarraghur.	
January	...	2	...	...	1	...	...	...	...	...	...	...	3
February	...	...	...	...	...	...	...	...	...	1	...	...	1
March	...	...	...	...	...	...	...	...	...	...	...	...	...
April	...	...	...	1	...	...	...	...	...	...	1	...	2
May	...	2	...	1	...	...	...	...	...	...	...	...	3
June	...	...	...	...	...	...	...	...	...	...	...	...	...
July	...	...	...	...	...	...	...	...	...	...	...	...	...
August	...	1	...	...	3	...	...	...	...	...	1	...	5
September	2	2	1	...	...	...	1	1	1	1	4	...	13
October	...	...	...	...	3	...	...	...	...	...	...	1	4
November	...	...	...	...	...	...	4	...	...	...	2	...	6
December	4	...	...	1	2	1	...	...	...	...	...	...	8
Total	6	7	1	3	9	1	5	1	1	2	8	1	45
Average Strength ...	375	768	36	446	1,387	184	552	889	102	463	650	28	6,380

Ages of Men who died of Enteric Fever.

Years Completed.														
15	19	20	21	22	23	24	25	26	29	32	35	36	37	Total.
1	2	1	3	2	4	1	3	2	2	1	1	1	1	25

The strength at the several ages, arranged in quinquennial periods, will be found at page 211.

It will be observed from these Tables that only a fifth of the admissions occurred during the first six months of the year; that there were no admissions during the first two months of the rainy season; but that the period of greatest prevalence of the disease was towards the end of that season; and that only four of the deaths occurred in men above 30 years of age.

The greatest proportion of cases was furnished by the 66th Regiment at Kurrachee and Hydrabad, in the Scinde Division; the 59th Regiment at Nusseerabad, in the Mhow Division; and the 3rd Hussars, at Ahmednuggur, in the Poona Division.

Paroxysmal Fevers were more prevalent than during the preceding year in the Presidency, Northern, and Scinde Divisions, and among the troops on the march, and less so in all the other Divisions. Their prevalence was greatest in the Northern and Mhow Divisions. In the former the admissions for them exceeded the strength, and in the latter they exceeded three-fourths of it, although fewer by more than a fifth than during the preceding year. The following are the stations at which the admissions for them were most numerous:—

Stations.	Ratio of Admissions per 1,000 of Mean Strength.
Mount Aboo	1754·1
Deesa	1079·8
Nusseerabad	952·3
Mhow	815·2
Hydrabad (Scinde) ..	778·7

At Mount Aboo the febrile attacks among the invalids are stated by the principal medical officer to have been in the ratio of 292·8 per 1,000 of the strength, while, among the men of the detachment of the 108th Regiment, the ratio was only 192·5. As the most weakly men of the several companies of that regiment at Deesa were selected to form the detachment at Mount Aboo, the evidence afforded by these numbers of the unsuitableness of that sanitarium for men suffering from malarious diseases must be regarded as very strong. The medical officer in charge remarks, that men who have escaped ague altogether on the plains often suffer from it there. At Deesa the febrile attacks were not only very numerous in the 108th Regiment, and the E Battery, 9th Brigade, Royal Artillery, but towards the end of the year they were also unusually severe, almost every case being attended with vomiting and purging, and many with a tendency to collapse, so that, the surgeon remarks, they might easily have been mistaken for cases of cholera. At Mhow in the 49th Regiment, considerable cerebral excitement is noted as having been an ordinary symptom in addition to gastric irritability.

The following Table shows the comparative prevalence of malarious fevers during the several quarters of the years 1871 and 1872:—

Quarter.	Ratio of Admissions for Malarious Fevers per 1,000 of Strength.	
	1872.	1871.
Ist	56·20	100·58
IInd	58·31	132·26
IIIrd	119·04	174·37
IVth	263·48	131·40

The mortality, as has been mentioned, was greatly below the average, only four deaths having resulted from malarious fever during the year. Of these one took place in the Royal Artillery, at Bombay, in February; one in the 49th Regiment, at Mhow, in September; one in the 108th, at Deesa, in November; and one in the 83rd, at Poona, in December.

Malignant Cholera, which had been almost entirely absent during the two preceding years—there having been no admissions for it in 1871, and but one in 1870—again assumed the place of the most fatal disease in the Command in 1872, although it was on this occasion confined to the Poona and Mhow Divisions. In the former there were 7 admissions for it, with 6 deaths; and in the latter 35 admissions, with 27 deaths. A fatal case at Tarraghur, returned as simple cholera, is not included in these numbers.

The following Table, extracted from the Principal Medical Officer's Report, shows the particular stations at which the cases and deaths occurred, the duration of the outbreak at each, and the number of attacks and deaths among the men, women, and children.

Bombay.

Stations.	Date of occurrence of First Case.	Date of occurrence of Last Case.	Total Number of Cases.			Recovered.			Died.		
			Men.	Women.	Children.	Men.	Women.	Children.	Men.	Women.	Children.
Mhow ..	7 April	11 April	3	1	2	1	..	..	2	1	2
Mhow ..	12 May	27 May	1	5	6	..	..	2	1	5	4
Indore ..	24 May	28 May	2	..	..	..	..	..	2	..	..
Neemuch ..	8 June	24 July	8	..	..	1	..	..	7	..	..
Ahmednuggur	25 June	25 June	1	..	..	..	..	..	1	..	..
Poona ..	11 July	3 Aug.	5	3	..	1	..	..	4	3	..
Indore ..	3 Aug.	3 Aug.	1	..	..	..	..	..	1	..	..
Poona ..	14 Aug.	14 Aug.	1	..	..	..	..	..	1	..	..
Neemuch ..	17 Aug.	22 Aug.	9	..	..	2	..	..	7	..	..
Neemuch ..	12 Sept.	23 Sept.	11	..	2	4	..	..	7	..	2
Total ..	7 April	23 Sept.	42	9	10	9	..	2	33	9	8

It will be observed that the disease was greatly most severe at Neemuch, where there were 28 attacks and 21 deaths. All the deaths and 26 of the attacks were in the detachment of the 59th Regiment at that station, of which the average strength was 324. In D Battery, 18th Brigade, R. A., of which the strength was 151, there were but two attacks and no deaths. There was nothing in the position or construction of the barracks occupied by the two corps, or in their food, clothing, or duties, to account for this difference; and the surgeon in charge of the infantry detachment appears to think that it is to be attributed to the insufficiency of the precautions taken to prevent the men of that detachment from visiting infected localities occupied by the native population.

Rheumatism was more prevalent than during the preceding year in the Presidency and Poona Divisions, and less so in all the others. In the force generally the amount of inefficiency resulting from it was exactly the same as in 1871.

Syphilis was greatly more prevalent in the Presidency and Mhow Divisions, but greatly less so in all the others, the result for the whole command being a large reduction. The stations at which it was most prevalent were Nusseerabad and Neemuch, and after them, but at a long interval, Sattara and Bombay. Those at which it was least so were Aden, Ahmednuggur, Hydrabad, and Deesa. The following Table shows the ratio of admissions for syphilis per 1,000 of the strength at each of the principal stations in the Command during each of the last three years:—

Stations.	Ratio of Admissions for Syphilis per 1,000 of Strength.			Stations.	Ratio of Admissions for Syphilis per 1,000 of Strength.		
	1872.	1871.	1870.		1872.	1871.	1870.
Colaba	96·4	76·1	114·4	Neemuch.. ..	172·8	196·4	68·2
Poona	38·2	48·5	81·1	Nusseerabad ..	189·2	136·3	131·6
Sattara	119·6	27·3	2·1	Ahmedabad ..	44·1	28·8	96·2
Ahmednuggur ..	37·9	43·7	68·8	Deesa	33·7	107·3	223·2
Asseerghur ..	69·6	88·7	132·3	Mount Aboo ..	73·8	132·7	103·4
Belgaum	58·0	134·6	99·0	Kurrachee ..	49·5	90·5	98·1
Kirkee	53·0	76·7	119·8	Hydrabad ..	26·7	103·4	36·4
Mhow	103·9	93·1	106·8	Aden	12·8	27·8	44·5
Indore	88·2	186·4	139·5				

This shows an increase at 5, and a reduction at 12 stations.

Scrofula and Phthisis.—The ratio of admissions for these diseases was lower than during the preceding year in the Presidency and Aden Divisions, and among the troops on the march, and higher in all the other Divisions. That of mortality from them was lower in the Aden Division, but higher in all the others except the Presidency one, in which there were no deaths from phthisis either in 1871 or in 1872. The greatest mortality was in the Northern Division, where the ratio of deaths was 6·10 per 1,000 of the strength. In the Mhow and Poona Divisions, which came next in the order of fatality of these diseases, the ratios were 1·53 and 1·44.

Anæmia.—There were no admissions under this head in the Presidency Division, in which during the preceding year they amounted to 17·4 per 1,000 of the strength, and the proportion was much reduced in all the other divisions except the Northern and Scinde ones.

Local Diseases.—*Diseases of the nervous system* were more prevalent than during the preceding year in the Presidency, Poona, Scinde, and Aden Divisions, but, except in the last, the increase was not considerable, and in all the other Divisions there was a decrease. The mortality from them was considerably increased in the Northern and Aden Divisions, in which also the ratios of admissions were highest. In the other Divisions there was little change. Neuralgia was the most prevalent disease of this order, and sunstroke the most fatal, 30 of the 33 deaths having resulted from it and apoplexy. The stations at which the mortality was greatest were Deesa, Kurrachee, Ahmednuggur, and Aden.

Diseases of the eye were more prevalent in the Presidency, Northern, and Aden Divisions, and less so in all the others, the reduction in the force as a whole being considerable. The great majority of the admissions under this order were for "conjunctivitis," but there was no excessive prevalence of that disease in any particular corps.

Diseases of the circulatory system were greatly reduced in prevalence in all the divisions, and much below the average.

Diseases of the respiratory system were more prevalent than in 1871 in the Presidency Division, but much less so in all the others, except Poona, in which they were the same, and the mortality from them was everywhere very low. The increase in the Presidency Division was due to the prevalence of bronchitis and bronchial catarrh in the Artillery at Colaba.

Diseases of the digestive system were more prevalent than during the preceding year in the Poona and Aden Divisions, and less so in all the others. The mortality from them was increased in the Presidency, Poona, Scinde, and Aden Divisions, and reduced in the Mhow and Northern Divisions. In the command as a whole there was a slight reduction in the ratio of admissions, and a slight increase in that of deaths, but both were below the average. The following is the order in which the Divisions stand with reference to the prevalence of diseases of this order: Scinde, Aden, Northern, Presidency, Poona, Mhow. The ratio of admissions for them per 1,000 of the strength was 298·1 in the first, and 154 in the last. Arranged according to the

Bombay. mortality from diseases of the digestive system, the Divisions stand as follows: Presidency, Aden, Scinde, Poona, Mhow, Northern. The proportion of deaths per 1,000 of the strength was 11·21 in the first, and 1·74 in last. Dysentery, diarrhœa, hepatitis, dyspepsia, and tonsillitis caused as usual the great majority of the admissions under this order.

The relative prevalence of these diseases, and the mortality resulting from them in each of the Divisions, are shown in the following Table:—

1872.	Ratio per 1,000 of Strength.													
Military Division.	Presidency.		Poona.		Mhow.		Northern.		Scinde.		Aden.		Troops on the March.	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Dysentery	51·6	...	36·2	1·68	18·0	·77	16·6	...	55·0	·87	54·0	1·42	30·7	...
Diarrhœa	49·3	...	54·1	·72	47·9	...	58·4	...	117·8	...	92·4	...	35·4	...
Hepatitis, including Hepatic Abscess ...	67·2	11·21	21·1	·72	33·7	1·91	47·9	1·74	23·6	·87	42·7	5·69	14·2	...
Dyspepsia...	13 6	...	22·7	...	16·9	...	49·7	...	25·3	...	48·4	...	14·2	...
Tonsilitis	17·9	...	14·8	...	8·0	...	6·1	...	13·9	...	4·3	...	7·1	...
Total	199·6	11·21	148·9	3·12	124·5	2·68	178·7	1·74	235·6	1·74	241·8	7·11	101·6	...

Diseases of the urinary system.—There was an increase in the ratio of admissions for these diseases in the Presidency, Poona, and Aden Divisions, and a reduction in all the other Divisions, the result for the whole Command being a slight decrease. The great majority of the admissions were, as usual, for gonorrhœa and its sequelæ, which were in the ratio of 81·48 per 1,000 of the strength in the Command. The stations at which they were most prevalent were Sattara, Ahmedabad, Belgaum, Nusseerabad, Ahmednuggur, and Neemuch, their arrangement being according to the degree of prevalence at each.

Conditions, &c.—The admissions for debility were much less numerous than during the preceding year in the Mhow and Northern Divisions, but more than twice as numerous in the Aden, Scinde, Poona, and Presidency Divisions. The increase in the latter was probably due in a great measure to the prevalence of dengue, as malarious fevers, to which and the effects of long tropical service the cases admitted under "debility" are as a rule attributable, were less prevalent than usual in 1872.

Poisons.—Except in the Aden Division, in which in 1871, there was but one admission under this head, the ratio of admissions was everywhere lower than during the preceding year. With one exception all the admissions were for delirium tremens, or poisoning by alcohol. Arranged according to the order of the prevalence of these affections, the divisions stand as follows: Scinde, Northern, Presidency, Mhow, Aden, Poona.

Injuries.—The proportion of admissions for accidental injuries was slightly increased in the Aden Division, but greatly reduced in all the others, the reduction being chiefly in contusions. Of the 10 accidental deaths recorded, six were by drowning, four of them in the 3rd Battalion, 60th Rifles at Aden, one in the Royal Artillery at Baroda, and one in the 15th Hussars on the march from Mhow to the Bengal Presidency; one was from fracture of the skull, in the Royal Artillery at Aden; one from fracture of the ribs, with injury of the lungs, in the Royal Artillery at Hydrabad; one from multiple injury caused by a fall into a quarry, in the 68th at Poona; and one by rifle shot in a man of the Rifle Artillery, at Tarraghur. The deaths by suicide were more numerous than during the preceding year. There were four by rifle shot, one at each of the following stations, Mhow, Deesa, Aden, and Hydrabad; two by cut-throat, one at Kurrachee, the other at Sattara; and one by hanging, at Hydrabad.

The admissions, deaths, and invaliding in the several corps serving in the Command during the year were as follows:—

Regiments.	Average Annual Strength.	Admitted into Hospital.	Deaths. In India.	Deaths. Of Invalids.	Deaths. Total.	Annual Ratio per 1,000. Admitted.	Annual Ratio per 1,000. Died.	Stations during the Year.	Months.
CAVALRY.									
3rd Hussars ..	475	434	9	1	10	913·7	21·05	Ahmednuggur	11⅔
								On march	⅓
15th „ ..	440	674	8	..	8	1531·8	18·18	Mhow	10¼
								On march	⅔
Total Cavalry.	915	1,108	17	1	18	1210·9	19·67		
ROYAL ARTILLERY.									
								Batt.	
D Brigade R.H.A.	305	445	2	..	2	1459·0	6·56	C, Ahmednuggur	10
								On march	½
								Embkd. for England.	
6th Brigade R. A.	477	781	10	3	13	1637·3	27·25	E, Mhow	10
								On march	½
								Embkd. for England.	
9th Brigade R. A.	587	1233	13	..	13	2100·5	22·15	B, Kirkee	1
								On march	1⅓
								Kurrachee	9½
								D, Nusseerabad	9⅔
								On march	2⅓
								E, Deesa	12
								F, Ahmedabad	1½
								On march	1
								Kirkee	9½
18th Brigade R.A.	885	1388	11	..	11	1568·3	12·43	A, On march	2½
								Belgaum	9⅔
								B, Kurrachee	2⅔
								Hydrabad	9⅓
								C, On march	2⅔
								Ahmedabad	9⅓
								D, Neemuch	12
								E, Kirkee	10⅔
								Poona	⅔
								On march	⅔
								F, Kirkee	11¼
								On march	⅔
Total Artillery..	2254	3847	36	3	39	1706·7	17·30		
INFANTRY.									
1st Bn. 2nd Foot	923	668	6	..	6	723·7	6·50	Belgaum	12
1st „ 8th „	148	120	1	..	1	810·8	6·76	Nusseerabad	1
								On march to Bengal.	
49th Foot ..	891	1172	15	..	15	1315·4	16·84	Mhow	12
								Detachment at Indore	10

Bombay

Regiments.	Average Annual Strength.	Admitted into Hospital.	Deaths. In India.	Deaths. Of Invalids.	Deaths. Total.	Annual Ratio per 1,000. Admitted.	Annual Ratio per 1,000. Died.	Stations during the Year. Months.
INFANTRY—*cont.*								
56th Foot ..	922	1408	12	..	12	1527·1	13·02	Poona 12
59th „ ..	887	1633	36	1	37	1841·0	41·71	On march 1; Nusseerabad 11; Detachment at Neemuch 12
3rd Bn. 60th Foot	516	698	15	2	17	1352·7	32·95	Aden 11; Embrkd. for England.
66th Foot ..	924	1521	19	2	21	1646·1	22·73	Kurrachee 12; Detachment at Hydrabad 12
68th „ ..	655	1344	12	..	12	2051·9	18·32	Arrived from England. Poona 10½
83rd „ ..	884	1110	11	1	12	1256·7	13·57	Poona 12; Detachment at Asseerghur, Colaba, and Sattara.
105th „ ..	53	118	1	..	1	2226·4	18·87	Arrived from Bengal. On march and at sea ⅔; Aden 1
108th „ ..	911	2222	24	..	24	2439·0	26·34	Deesa 12; Detachment at Mount Aboo.
Total Infantry..	7,714	12,014	152	6	158	1557·4	20·48	

The ratio of admissions was highest in the Artillery, and lowest in the Cavalry. That of mortality was highest in the Infantry, and lowest in the Artillery.

The comparatively low ratio of admissions in the Cavalry was due in a great measure to the almost total exemption of the two regiments from dengue, which caused so many admissions in the other arms. Ague continued very prevalent in the 15th Hussars, at Mhow, the admissions for it being in the ratio of 838·6 per 1,000 of the strength. The most fatal diseases in the two regiments were sunstroke, enteric fever, and cholera.

In the Artillery, the brigades in which the ratios of admissions and deaths were highest were the 9th and 6th, and that in which both were the lowest was the D Brigade, Royal Horse Artillery. The prevailing diseases in the 6th and 9th Brigades were dengue, simple continued fever, ague, venereal diseases, bowel affections, and debility; and the most fatal diseases were hepatitis, and enteric fever.

In the Infantry the highest ratio of admissions was furnished by the 108th Regiment at Deesa and Mount Aboo, the excess being due in a great measure to the great prevalence of ague and dengue; and the lowest by the 1st Battalion of the 2nd Regiment, at Belgaum, where these diseases prevailed to a very limited extent.

The mortality was highest in the 59th Regiment, at Nusseerabad and Neemuch, the excess being attributable to the epidemic of cholera at the latter station, which caused 26 admissions and 21 deaths, and after it in the 3rd Battalion, 60th Rifles, at Aden, in which it was raised by the occurrence of four deaths by drowning. The lowest ratio of deaths was furnished by the 1st Battalion of the 2nd Regiment, at Belgaum. *Bombay.*

SANITARY REPORT.

Inspector-General O'Flaherty, C.B., reports :—

Barracks.—The following new barracks were taken into occupation during the year :—At *Kurrachee.* Five upper-storied for the Infantry.—At *Mount Aboo.* Upper-storied family quarters for 20 families.—At *Mhow.* Two upper-storied Cavalry and Infantry barracks.—At *Nusseerabad.* In Artillery lines, two half-company upper-storied ; and in Infantry lines, two of the same and a block of married quarters.—At *Aden.* One barrack on conversion into upper-storied.—At *Ahmednuggur.* One upper-storied for Artillery, and family quarters for Infantry.

The new barracks at Mhow, both Cavalry and Infantry, taken into occupation in 1871, are highly spoken of, as also are those at Neemuch ; but the latter are represented as having one defect, viz., the absence of sun-shades similar to those at Mhow. In a report, to the Bombay Government, on the subject of the greater temperature of the upstairs new barrack rooms, I represented that I conceived the faults in them to be the very high open arched construction of the outer wall of verandahs, and the high placed, short, and not sufficiently pent-like roof, permitting the sun to heat the wall of the room, more especially in the upper storey ; I suggested, as an easy and inexpensive improvement, that these arches should be closed with lattice-work, which could be opened at pleasure. This addition to the barrack would, I am sure, be very beneficial ; and, as Government has called for reports and estimates for the work from the Public Works Department, it will, I hope, be effected. Observations confirm the remark, made last year, that there were more admissions for fever amongst the men occupying the lower than the upper rooms, but it should be remembered that the former were not constructed for dormitories, and are generally more confined, and less suited for general living rooms, than the latter. No progress has been made with the new barracks at Colaba, which is the more to be regretted as the barracks of the sanitarium being so bad, and circumstances rendering it desirable to remove the Sanitarium Hospital, it would be advantageous to concentrate the whole at that place.

Accommodation and Ventilation.—The accommodation has been sufficient, as a rule, in all the barracks during the year, and has afforded the regulation cubic space and superficial area. The ventilation also has been satisfactory. The barracks at Ahmedabad remain unchanged, but plans for improvement are under consideration. The bad condition of the married quarters at Colaba is still complained of. The barracks at Deesa are reported as faulty in construction and very inferior. When it was proposed to build hut barracks at Ooria on Mount Aboo, I suggested that they should be constructed so that each man should have a small room to himself. The intention of building at this place has been abandoned for the present.

Flooring.—Mud floors remain at some stations, but are generally being replaced by stone. The relative merits of stone, asphalte, concrete, and wood have been discussed ; my opinion is that good seasoned teak forms the most suitable flooring. The upper floors of the new barracks at Mhow have been replaced by stone.

Lime-washing.—The barracks have all been regularly white-washed twice during the year.

Lighting.—The miserable lighting of the barracks and hospitals is still much complained of. Kerosine lamps were tried experimentally at Poona and found to answer well. They have been in use for some years in Bengal, but in this Presidency, oil burners only are used, yielding but poor light.

Warming.—The subject of supplying fuel during the months of December and January at some of the stations where the cold is greatest, as recommended by me last year, is under the consideration of the Government of India.

Bombay. *Conservancy.*—The Dry-Earth System continues to work well and gives general satisfaction. It is in use at all stations except Bombay and Aden; at the former place a little M'Dougal's powder is used instead of earth, owing to a difficulty in removing a quantity of soil. At Aden, earth can scarcely be got. At the time of epidemics at any station it is ordered that two ounces of M'Dougal's powder be thrown into each privy-pan twice daily. The mode of disposing of the refuse at Asseerghur is still objectionable, but renewed efforts have been made for improvement.

Latrines for natives have been provided at Colaba, and others are being built at Poorundhur. Similar accommodation is required for the hospital servants and people of the bazar in the Ghorepoorie Lines, Poona.

Ablutionary Arrangements.—The ablution rooms attached to the new barracks are very good in their arrangements, and at almost all stations the accommodation is sufficient and good, and the supply of water ample. A basin is now allowed to each man in corps not occupying barracks having lavatories with fixed basins. Increased or improved arrangements for ablution are required at Mount Aboo, Ghorepoorie Barracks, Poona, and Poorundhur.

Rations.—There has been no change in the composition of the rations, they have been generally very good, and there was little ground for complaint. Mutton was issued twice in each week, and the quality of it was generally considered better than that of the beef. The want of beef, or change from the constant mutton diet at Mount Aboo continued to be felt. At Aden, for the first seven weeks of the year, salt meat was issued twice a week, but since then the troops have had fresh meat every day. Potatoes have been supplied regularly at this station throughout the year. The supply of vegetables was sufficient at all stations, but at Hydrabad there was difficulty in obtaining them sometimes. Deputy Inspector-General Gallwey considers that the ration bread in India has generally a tendency to sourness when new, and an absolute sourness before it is stale; this he thinks is owing to the character of the yeast, and the use of inferior wheat imperfectly ground into sugee instead of good fine flour. Arrangements are now pretty general, by which the men may get a cup of coffee and some bread as soon as they get up in the morning. In two or three regiments the coffee is taken into the men's rooms by the contractor, and it is thought that many men avail themselves of it who would not take the trouble to walk across to the coffee shop.

The Cooking Arrangements have been satisfactory, and there has been sufficient variety in the cooking. The ordinary Indian means of cooking in tinned vessels is generally used, and preferred to the cooking ranges which exist in some barracks.

Water Supply.—There has been no change in the water supply during the year, and, with the exception of at Kurrachee and Nusseerabad, it was generally good. The potable water at Nusseerabad is brought from a well two miles from the station, which the Surgeon of the 59th reports is situated by the roadside and close to a good-sized village, and thus exposed to great risk of pollution. It would be advisable to protect this well more from possible contamination. It is intended to collect and store the rainfall at some of the barracks for use at this station. The supply at Kurrachee remains the same as mentioned last year, every care seems to be taken to keep it free from pollution. The Silicated Carbon filters under trial last year were condemned as unsuitable for general adoption, and some filter carts were found too heavy for the draught cattle. I recommended the adoption of the M'Namara filter, as, from the description given of it, and the various reports upon it furnished from Bengal, where its introduction had been resolved upon, I was convinced it is more efficient than the present Gurrah one. In this recommendation his Excellency the Commander-in-Chief concurred, and the Government sanctioned that some should be made, but none have as yet been issued.

Clothing.—The clothing of the troops may be said to be on the whole very suitable to the climate and seasons of the year. It is thought by some Medical Officers that the shape of the helmet might be improved, both in regard to appearance and increased protection to the sides of the head. In the Cavalry regiment now serving in the command, a serge tunic has been issued with the greatest comfort to the men. The cloth trowsers are still, almost necessarily,

used for mounted duties, both in the Cavalry and Artillery. Deputy Inspector-General Gallwey recommends the discontinuance of wearing the waistbelt by the Infantry soldier when off duty, as he considers it not only a source of discomfort, but of positive evil to the wearer, besides being not so becoming in appearance as the loose frock of the Cavalry or Artillery man. There has been no change in the bedding of the men, and no complaints made of it. *Bombay.*

Gymnastic Exercises.—The reports of Medical Officers on the effects of the training on the muscular development and health of the men who have been through a course at a gymnasium are very favourable. The general health and physique of the men is said to be much improved, and the muscles, weight, and measurements of chest and limbs considerably increased. No ill effects beyond strains and blisters are reported to have resulted, but an opinion is expressed that the course of instruction should be somewhat modified during the hot months of April and May, and in this I concur.

Sanitary Condition of Vicinity of Barracks.—The sanitary defect brought to notice in the Report for 1870, as existing in the vicinity of the Sanitarium Hospital, Colaba, viz., the native bazaar being immediately opposite to it, engaged the attention of Government, and negociations were ordered to be made with the owner for the removal of the houses. The houses were pulled down, the ground cleared, and the hospital wall on that side lowered to a dwarf one, but a new range of shops is being built on the same site which, being two stories in height, will more completely than before shut in and overlook the hospital on that side. Under these circumstances I consider it would be best to give up the present hospital building, and to form at Upper Colaba a Station Hospital to accommodate the sick of the sanitarium as well as of the artillery and infantry there stationed. The sanitary condition of the foreshore at Colaba has been improved by the provision of increased latrine accommodation for natives, and by police precautions to prevent nuisance. The large latrine for natives at Asseerghur, directly in front of and close to the barrack, continues to be reported, by the Medical Officer in charge and the Deputy Inspector-General, as a great nuisance; renewed representations about it have been made, but as yet without apparent avail.

A similar evil exists, but in a lesser degree, at Aden; there is, however, every probability of its early removal. The sanitary condition of Mount Aboo has been the subject of much attention, and a special grant has been sanctioned for carrying out drainage works and other necessary improvements.

Section II.

On the Extent of Invaliding.

During 1872, 2,229 invalids were sent home from India, and 653 were finally discharged from the service at Netley, the ratios per 1,000 of the mean strength represented by these number being respectively 37·62, and 11·02; both lower than the corresponding ratios for 1871, the latter considerably so. The decrease in the proportion sent home from India occurred wholly in the Bengal Command, in which it amounted to 6·73 per 1,000 of the strength. In the Madras and Bombay Commands respectively there was an increase of 9·71, and 5·93 per 1,000 of the strength. *India.*

The following Table contains a summary of the disabilities of the invalids, arranged in the classes and orders of the nomenclature, framed from Abstract No. 19 in the Appendix, in which they are stated in detail:—

India.

Station	Invalids sent home from Bengal.	Madras.	Bombay.	Invalids from India discharged the service at Netley.
Mean Strength	36,839	11,511	10,898	59,248
General Diseases.				
Febrile Group	100	4	18	10
Constitutional Group	344	96	69	159
Local Diseases.				
Diseases of the—				
Nervous System	118	31	21	29
Eye	19	2	8	28
Ear	10	2	4	11
Nose	..	..	..	1
Circulatory System	185	38	35	162
Absorbent „	2	..	..	..
Ductless Glands	2	..	..	1
Respiratory System	42	6	28	18
Digestive „	309	135	69	93
Urinary „	22	6	4	9
Generative „	7	6	..	4
Organs of Locomotion	18	6	5	23
Cellular Tissue	4	..	..	2
Cutaneous system	14	2	3	18
Debility	258	95	36	51
Injuries—				
Accidental	23	7	10	25
Self-inflicted	1	..	..	..
Surgical Operations	3	..	2	7
Total	1,481	436	312	653
Ratio per 1,000 of Mean Strength. 1872	40·20	37·88	28·63	11·02
Ratio per 1,000 of Mean Strength. 1862–71	41·86	49·02	33·73	19·71

In all the Presidencies the amount of invaliding was below the average of the previous 10 years. The increase in the Madras Command over the proportion in 1871 occurred chiefly in diseases of the digestive system and debility. That in the Bombay Command occurred in the same diseases and affections of the circulatory and the respiratory systems. The decrease in Bengal was greatest in anæmia and debility, diseases of the digestive system, and rheumatism. Diseases of the digestive caused the largest amount of invaliding from India, and next to them came debility, diseases of the circulatory system, and scrofula and phthisis. There was a considerable increase in the proportion invalided for diseases of the circulatory and nervous systems, and a reduction in that invalided for malarious fevers. Diseases of the circulatory system were the most frequent causes of final discharge from the service, and next to them, diseases of the digestive system and phthisis.

Section III.

Mean Daily Sick.

The average number of men constantly ineffective from sickness in 1872 was, in Bengal 2122·44, in Madras 677, and in Bombay 521. The usual information, deduced from these numbers, is given in the following Table :—

	Bengal.		Madras.		Bombay.	
	1872.	1862-71.	1872.	1862-71.	1872.	1862-71.
Ratio per 1,000 constantly Sick ..	57·66	58·85	58·81	62·67	47·81	58·83
	Days.	Days.	Days.	Days.	Days.	Days.
Average Sick Time to each Soldier .	21·09	21·48	21·52	22·87	17·50	21·47
Average Duration of Cases ..	14·14	13·53	16·26	16·73	11·23	14·70

Compared with the results for 1871, this shows a slight reduction in the proportion constantly sick in Bengal, a considerable reduction in Bombay, but an increase of 2·56 per 1,000 of the strength in Madras. The average sick time to each soldier was slightly less in Bengal, five days less in Bombay, and one day greater in Madras. The average duration of the cases was reduced in all the Presidencies.

Section IV.

On the Influence of Age on Mortality.

In Abstract No. 20 in the Appendix, the details are given of the strengths and deaths, at different ages, of the troops serving in India in 1872. The following table shows the results, and also the average of the ten preceding years:—

	Under 20.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.	
	Strength on 1st January.	Died.	Strength on 1st January.	Died.	Strength on 1st January.	Died.	Strength on 1st January.	Died.	Strength on 1st January.	Died.	Strength on 1st January.	Died.
Bengal	1,953	16	10,041	230	8,963	221	7,309	230	3,323	156	533	46
Madras	754	6	2,790	45	2,203	35	2,231	57	869	33	208	16
Bombay	760	5	3,474	56	2,229	42	1,377	40	733	27	134	4
Total	3,467	27	16,305	331	13,395	298	10,917	327	4,925	216	875	66
Ratio of deaths per 1,000 of Strength (350)	7·79		20·30		22·25		29·95		43·86		75·43	
Ditto, 1862-71 ...	9·00		17·30		23·85		32·99		41·38		63·50	

This table shows the deaths among the troops under 20 years of age to be identical (almost) with those of the preceding year; a very considerable increase occurs in the next two periods, and, again, also among men of upwards of 40 years. When compared with the ratios for the preceding ten years, the deaths among those under 20 years, between 25 and 30, and 30 and 35, are a little below, and those at all the other ages are above the average; those between 20 and 25, and above 40, being considerably in excess. They indicate an increasing ratio of mortality from the earliest age to the latest, the increase, however, being most marked at the higher ages. So far as the earlier ages are concerned these results cannot, however, be accepted without modification. The strength of the class under 20 years of age is certainly above the average strength for the whole year, as drafts of recruits for the most part arrive towards the end of the year, and from the date of their arrival the

India. strength of the class gradually diminishes until the corresponding period of the following year. While, of the men who were included in that class on the 1st of January and who die during the year, a considerable proportion having by that time passed twenty years of age, are necessarily returned under the next class. But there is a more serious source of error, the recruit's own statement is accepted as to his age, and his service before 18 does not count. Multitudes of lads of 16 and 17 are returned as 18. It is certain, also, that a very considerable number of men far beyond the limit as to age manage to enter the service by declaring themselves to be under that limit. The statistics of the period between 20 and 30 are, therefore, to some extent vitiated by the inclusion on the one side of a number of men under 20 years of age, and, on the other, of a considerable number beyond 30.

XII.—ON THE HEALTH OF TROOPS ON BOARD SHIP.

STATISTICAL REPORT.

Troops on Board Ship. The Troops who made sea voyages during the year, as shown by the Ship Returns, were as follows:—

I.	Troops or drafts proceeding on foreign service	12,483
II.	Do. returning from foreign service	4,508
III.	Do. passing by sea from one Colony to another, or from one station in a Military Command to another	6,885
IV.	Invalids and "time-expired men" returning to England	3,225

In the last group are included 215 time-expired men, and 227 effective men embarked with the invalids and whom it has been found impossible to separate from them. Arrangements have been made which it is hoped will secure accurate returns of the different classes in all cases in future.

I. Troops proceeding on Foreign Service.

The average annual strength represented by the 12,483 men who embarked for foreign service during the year was 1,177; their admissions into hospital were 513; and the deaths among them were six.

The ratios per 1,000 of the strength represented by these numbers are for admissions 435·8, and for deaths 5·10.

The particular diseases by which the admissions and deaths were caused are detailed in Abstract No. 21 of the Appendix, from which the following Table, showing the influence of the different classes and orders of diseases, has been framed:—

Troops on Board Ship.

Order.	Stations ..	To the Mediterranean.				To other Stations except India.				To India, *viâ* Egypt.			
	No. of men Embarked	2,005				1,947				8,531			
	Average *Annual* Strength ..	78				228				871			
	Diseases.	Admitted.	Died.	Ratio per 1,000. Admitted.	Died.	Admitted.	Died.	Ratio per 1,000 Admitted.	Died.	Admitted.	Died.	Ratio per 1,000 Admitted.	Died.
	I. *General Diseases.*												
1	Febrile Group ..	6	..	76·9	..	12	..	52·6	..	36	1	41·3	1·1
2	Constitutional „ ..	5	..	64·1	..	21	..	92·1	..	83	..	95·3	..
	II. *Local Diseases.* Diseases of the—												
1	Nervous System ..	1	..	12·8	..	1	..	4·4	..	3	..	3·5	..
2	Eye	..	..	..	..	..	..	..	..	3	..	3·5	..
3	Ear	..	..	..	..	1	..	4·4	..	..	..	..	..
4	Nose	..	..	..	..	1	..	4·4	..	..	..	..	..
5	Circulatory System ..	..	..	..	..	..	..	..	..	..	2	..	2·3
6	Absorbent „ ..	..	..	..	..	..	..	..	..	6	..	6·8	..
8	Respiratory „ ..	3	..	38·5	..	14	..	61·4	..	26	2	29·9	2·3
9	Digestive „ ..	4	..	51·3	..	22	..	96·5	..	36	1	41·3	1·1
10	Urinary „ ..	9	..	115·4	..	14	..	61·4	..	64	..	73·5	..
11	Generative „ ..	..	..	..	..	2	..	8·8	..	3	..	3·5	..
12	Organs of Locomotion	1	..	12·8	..	1	..	4·4	..	..	..	..	..
13	Cellular Tissue ..	3	..	38·5	..	5	..	21·9	..	7	..	8·0	..
14	Cutaneous System ..	1	..	12·8	..	14	..	61·4	..	56	..	64·3	..
	III. *Conditions, &c.*												
	Debility	1	..	12·8	..	2	..	8·8	..	7	..	8·0	..
	V. *Injuries.*												
2	Accidental	5	..	64·1	..	10	..	43·8	..	23	..	26·4	..
	No appreciable disease	..	..	..	..	..	..	..	..	1	..	1·1	..
	Total	39	..	500·0	..	120	..	526·3	..	354	6	406·4	6·8

The admissions were in rather a higher ratio than during the preceding year in the troops proceeding to the Mediterranean and other stations except India, but in a considerably lower one in those proceeding to India. The ratio in all the groups was extremely moderate. Measles broke out on board the "Crocodile" on the voyage to India, commenced on the 18th January, having evidently been introduced by the families of the 1st Battalion 18th Regiment, among whom there had been some cases at Queenstown before their embarkation. Four cases occurred among the men of that regiment, and many among the children, before their disembarkation at Malta. One case of small-pox occurred on board the "Orontes" on the voyage from Portsmouth to Singapore, commenced on the 4th January, but the disease did not spread.

One case of enteric fever occurred in the "Euphrates," on the voyage from Queenstown to Bombay, commenced in October, and one in the "Malabar," on that commenced on the 24th January.

Troops on Board Ship. As is usual, on the embarkation of a number of young soldiers for foreign service, there were a considerable number of admissions for primary syphilis and gonorrhœa soon after several of the transports went to sea, but they did not exceed the average.

II. Troops returning from Foreign Service.

The number of men embarked for the voyage home, exclusive of invalids, and the 442 time-expired and effective men referred to above, was 4,508, and they represented an annual strength of 382. Their admissions into hospital were 196, and the deaths among them were two; the ratios per 1,000 of the strength represented by these numbers being respectively 513·1, and 5·24; the former considerably below, and the latter greatly below the corresponding ratio for the preceding year.

The following Table, framed from Abstract No. 21 in the Appendix, shows the admissions and deaths from the principal clauses and orders of diseases:—

Stations..	From all Stations except India.				From India.			
No. of men embarked ..	1,786				2,722			
Average *Annual* Strength	129				253			
Order. Diseases.	Admitted.	Died.	Ratio per 1,000. Admitted.	Ratio per 1,000. Died.	Admitted.	Died.	Ratio per 1,000. Admitted.	Ratio per 1,000. Died.
I. *General Diseases.*								
1 Febrile Group	8	..	62·0	..	79	..	312·2	..
2 Constitutional „	5	..	38·7	..	16	1	63·2	3·95
II. *Local Diseases.* Diseases of the—								
1 Nervous System	..	..	..	..	1	..	4·0	..
2 Eye	..	..	..	..	3	..	11·9	..
3 Ear	1	..	7·8	..	..	..	..	..
5 Circulatory System	..	..	..	..	1	..	4·0	..
6 Absorbent „	..	..	..	..	2	..	7·9	..
8 Respiratory „	2	..	15·5	..	8	..	31·6	..
9 Digestive „	8	..	62·0	..	29	1	114·6	3·95
10 Urinary „	2	..	15·5	..	5	..	19·8	..
11 Generative „	..	..	..	..	3	..	11·8	..
12 Organs of Locomotion	1	..	7·8	..	..	..	..	..
13 Cellular Tissue..	1	..	7·8	..	1	..	4·0	..
14 Cutaneous System	4	..	31·0	..	8	..	31·6	..
III. *Conditions, &c.*								
Debility	..	..	..	..	1	..	4·0	..
IV. *Poisons*	1	..	7·8	..	..	..	..	..
V. *Injuries.*								
2 Accidental	..	..	..	..	6	..	23·7	..
Total	33	..	255·9	..	163	2	644·3	7·90

The ratio of admissions among the troops returning from other stations than India barely exceeded the half of that for the preceding year, and there were no deaths among them. Among those returning from India the ratio of admissions was higher, chiefly from the prevalence of relapses of ague in men of the Artillery from Mhow and Meerut, on board the "Jumna," in November and December, and an outbreak of dengue on board the "Malabar," in March, when 22 cases of that disease were admitted; but the ratio of deaths was very much lower. Three cases of measles, two of small-pox, and one of chicken-pox, occurred on board the last-mentioned vessel in March, and six of measles on board the "Euphrates," on the voyage from Bombay, *viâ* the Cape, in April, May, and June. *Troops on Board Ship*

III. Troops proceeding from one Colony or Station to another.

The number of men so embarked during the year was 6,885, and the average annual strength represented by them was 195. Their admissions into hospital were 157, and the deaths among them were 3, the former being in the ratio of 805·1, and the latter in that of 15·39 per 1,000 of the average strength.

Both these ratios are below the corresponding ones for 1871.

The diseases by which the admissions and deaths were caused are detailed in Abstract No. 21 in the Appendix, from which the following summary, in which they are arranged by classes and orders, has been compiled :—

		White Troops.			
Strength Embarked		6,885		Ratio per 1,000	
Average *Annual* Strength ..		195			
Order.	Diseases.	Admitted.	Died.	Admitted.	Died.
	I. *General Diseases.*				
1	Febrile Group ..	60	1	307·7	5·13
2	Constitutional „ ..	26	..	133·3	..
	II. *Local Diseases.*				
	Diseases of the—				
1	Nervous system	2	..	10·3	..
2	Eye	4	..	20·5	..
5	Circulatory System ..	1	..	5·1	..
6	Absorbent „	2	..	10·3	..
8	Respiratory „	5	..	25·6	..
9	Digestive „	11	..	56·4	..
10	Urinary „	9	..	46·2	..
11	Generative „	4	..	20·5	..
12	Organs of Locomotion ..	1	..	5·1	..
13	Cellular Tissue	4	..	20·5	..
14	Cutaneous System	15	..	76·9	..
	III. *Conditions, &c.*				
	Debility	3	..	15·4	..
	IV. *Poisons*	3	1	15·4	5·13
	V. *Injuries.*				
2	Accidental	7	..	35·9	..
4	Self-inflicted	..	1	..	5·13
	Total	157	3	805·1	15·39

Troops on Board Ship.

In all the principal orders the reduction was considerable, but it was greatest in the febrile group of general diseases, and diseases of the digestive system. The outbreak of measles from which the 1st Battalion of the 18th Regiment suffered during the voyage from Queenstown to Malta, in the end of January, affected also the 48th Regiment, which took the place of the former corps in the "Jumna," for the voyage from that island to Bombay. Only five of the men were attacked, but many of the children suffered from the disease, and several of them died of it. Two cases of scarlet fever occurred on board the "Himalaya" on the voyage from Natal to Mauritius in September, the infection having been brought on board at Cape Town by the family of a Bombardier of Artillery, who had recently suffered from the disease there. The ratio of admissions for febrile diseases would have been much lower but for the prevalence of ague in the 1st Battalion of the 10th Regiment, on board the "Adventure," on the voyage from Hong Kong to Singapore in December. All the deaths occurred in the same vessel, one on the voyage above-named from continued fever, the others in the 80th Regiment, on the voyage from Singapore and Penang to Hong Kong, one from delirium tremens, the other by drowning (suicide).

IV. Invalids, &c., returning to England.

The number of men included under this head was 3,225, of whom 2,783 were invalids, 215 time-expired men, and 227 effectives. Their average annual strength was 357. The number embarked sick was 237. 358 fresh cases of sickness or relapses were admitted to hospital on the voyage, and there were 39 deaths, all of invalids. These deaths have as usual been added to those in the Commands from which the men were invalided.

SUMMARY.

The following Tables show the principal results relative to the health of the Army at home and abroad in 1872, and the average of the ten preceding years :—

Summary.

TABLE showing the Sickness, Mortality, and Invaliding, and the proportion constantly Non-effective from Sickness per 1,000 of Mean Strength in the White Troops at Home and Abroad during the year 1872, and on the Average of the ten years 1862–71.

WHITE TROOPS.	Annual Ratio per 1,000 of Mean Strength.									
	1872.					1862–71.				
	Admitted into Hospital.	Died.	Sent Home as Invalids.	Discharged as Invalids.	Constantly Non-effective from Sickness.	Admitted into Hospital.	Died.	Sent Home as Invalids.	Discharged as Invalids.	Constantly Non-effective from Sickness.
United Kingdom	784·3	7·95	..	25·99	39·34	873·2	9·36	..	29·87	43·38
Gibraltar and Malta	843·1	7·72	26·48	17·58	43·46	752·1	11·03	20·08	18·95	38·82
Dominion of Canada	587·4	4·98	4·37	14·98	29·74	654·3	8·39	16·30	12·92	30·71
Bermudas	628·2	7·33	22·03	7·34	28·32	774·0	28·75	21·91	13·88	39·56
West Indies	851·8	8·89	19·76	8·99	35·09	1064·6	16·47	31·78	17·58	46·03
St. Helena and Cape	998·0	9·25	19·74	12·89	45·12	1009·0	10·82	29·23	20·50	50·70
Mauritius	1481·8	6·39	34·12	12·82	45·48	1116·9	21·13	46·17	18·60	49·36
Ceylon	1024·9	24·97	5·00	14·99	51·06	1365·3	23·15	53·46	25·50	63·53
China and Straits Settlements ..	2081·2	23·67	36·13	17·04	59·77	1932·1	63·08	86·06	39·05	42·95
India	1471·	25·30	37·62	11·00	56·04	1524·	25·00	41·91	19·71	59·65
On board Ship	493·7	6·27	..	..	..	673·2	12·02	..	..	..

TABLE showing the Sickness, Mortality, and Invaliding, and the proportion constantly Non-effective from Sickness per 1,000 of Mean Strength in the Colonial Corps serving Abroad during the year 1872, and on the Average of the ten years 1862–71.

COLONIAL CORPS.	Annual Ratio per 1,000 of Mean Strength.									
	1872.					1862-71.				
	Admitted into Hospital.	Died.	Sent Home as Invalids.	Discharged as Invalids.	Constantly Non-effective from Sickness.	Admitted into Hospital.	Died.	Sent Home as Invalids.	Discharged as Invalids.	Constantly Non-effective from Sickness.
Malta	790·5	8·45	..	..	..	847·7	8·42	..	..	..
West Indies	1121·6	19·03	..	16·22	59·29	1015·5	23·17	..	16·90	53·26
Western Africa	1664·0	39·68	..	..	75·24	1351·4	37·62	..	..	..
Ceylon	592·8	10·44	..	8·12	24·51	901·6	15·10	..	..	33·48
China and Straits Settlements	1104·2	20·83	..	..	..	..	..	..	..	..

APPENDIX.

APPENDIX No. I.

REPORT ON HYGIENE FOR THE YEAR 1873.

By E. A. Parkes, M.D., F.R.S., Professor of Hygiene in the Army Medical School.

The year 1873 has seen much activity in all sanitary matters. This has chiefly arisen in this country from the action of the Public Health Act of 1872, and in Germany from the return to the various sanitary schemes which were interrupted by the great war. The Adulteration of Food Act of 1872, has also given rise in England to much discussion and agitation, and has produced a great, and on the whole, beneficial effect.

In last year's Report I referred to Dr. Wilson's very useful Handbook of Hygiene, of which a second edition was soon called for. It has been followed by several other works intended for Medical Officers of Health, among which may be specially mentioned a "Manual for Medical Officers of Health," by Edward Smith, M.D., F.R.S.; and by the same author a "Handbook for Inspectors of Nuisances." Mr. Ernest Hart has edited "A Manual of Public Health," to which Mr. Michael contributes the legal part; Dr. Corfield, the purely sanitary portion; and Mr. Wanklyn, the section relating to the chemical processes demanded from Health Officers. In connection with the legal questions of public health, the "Digest of the Statutes relating to Urban Sanitary Authorities," and the corresponding work for Rural Sanitary Authorities, published by the Local Government Board at very low prices, will be found most useful.

A fortnightly journal, entitled "Public Health," has been commenced by Dr. Abbotts Smith, and appears likely to be a valuable aid to Medical Officers.

In France, a new edition of Beequerel's "Traité Elémentaire d'Hygiène," has been edited by Dr. Beaugrand. Morache has written for the "Dictionnaire "des Sciences Médicales," an article on Military Hygiene, of very great merit, to which reference will be made in a future Report. He has also published a complete treatise on the same subject.

In Germany, the year has as usual been signalized by a great number of journal articles and essays, several of which are discussed further on.

In consequence of the length of some of the sections, I have postponed until next year, a discussion on the Nature of Contagion and the section on War, some of the medical aspects of which have been well illustrated by the brilliant march to Coomassie.

The subjects discussed in the following Report, are:—

1. Food.
2. Air:
   - (*a.*) Floating solid bodies in air.
   - (*b.*) The inhalation of gases and vapours.
3. Soil.
4. Sewerage.
5. Spread of the specific diseases:
   - Typhus.
   - Enteric fever.
   - Yellow fever.
   - Cholera.
   - Malignant pustule.

I. Food.*

The "Adulteration of Food" Act, came into action during the year, and has had important effects. The principal articles of diet, which have been examined are, milk, butter, tea, bread, mustard, and pepper, and in all cases a considerable and very beneficial effect has been produced by the Act.

It has excited very considerable opposition, and even contributed to the unpopularity of the late Ministry, but it is to be hoped that no amount of trade influence will be allowed to interfere with its action. As the subject is one of great importance to all Health Officers, I shall enter as fully into it as my space will allow.

Milk.

Milk.—That a very large proportion of milk, as received by customers, was mixed with water had long been known, but until the reports of the analysts were published, the extent of the adulteration was not sufficiently understood. The magistrates have inflicted heavy penalties, and the consequence has been a decided improvement in the supply of milk. In some places the cost of milk has been raised, showing that the previous price could only have been remunerative because the milk was diluted. The analyses show no other falsification except the addition of water. If the Adulteration Act had had no other effect than this of improving the supply of milk, it would still have been most useful.

Mr. Wanklyn has published a little work on the Analysis of Milk,† in which he recommends determining the solids by taking only 5 c.c. (very carefully measured) and evaporating in a small flat platinum dish in a water-bath; in 3 hours the milk is dry, and with a good balance the error falls only in the second place of decimals. The weight expresses of course grammes in 5 c.c. of milk, which multiplied by 20, gives grammes in 100 c.c. After the residue is obtained the fat may be dissolved with ether, but as 5 c.c. gives a small quantity, Mr. Wanklyn prefes taking 10 c.c. of milk, evaporating nearly but not quite to dryness, and stirring (which is not necessary in the former case) and then dissolving in ether, not less than 50 c.c. (and generally more) of which are necessary. By putting an inverted small glass funnel over the milk and ether in the platinum dish, a sort of flask is formed which facilitates the extraction of the fat. After pouring off the ether and its evaporation, by means of a water-bath, nearly to dryness the dish is heated to 212° (in a hot air-chamber or by vapour) to drive off a trace of water and alcohol, and is then ready for weighing.

By this process Mr. Wanklyn divides his solids into 2 parts, viz.: "fat and "solids not fat." He assumes that 100 c.c. of milk contain 9·65 grammes of "solids not fat" (*i.e.*, of casein, lactine, and ash), and he takes this as a "rigid standard of normal milk," any departure from which will indicate sophistication.

In order to determine how much real milk a sample of milk under examination contains, he divides the "solids, not fat" of this milk by ·0965 (p. 32). At a subsequent page, however (p. 38), he slightly modifies this rule, and puts down the solids of normal milk at 12·5 grammes in 100 c.c., of which 3·2 are grammes of fat, and 9·3 grammes are "solids, not fat." His division here is, therefore, 9·3 which he thus uses; determine the "solids not fat" in 100 c.c. of any milk, and call this (a); then, the formula is

$$\frac{100 \times a}{9{\cdot}3} = \text{c.c. of real milk in the sample examined.}$$

To determine the amount of fat which has been abstracted by skimming, Mr. Wanklyn recommends the following formula: let (a) be the percentage of "solids, not fat," and (b) be the percentage of fat, then the grammes removed by skimming, are given by the formula—

$$\frac{3{\cdot}2}{9{\cdot}3}\,a - b.$$

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* A useful little book, "Adulterations of Food," has been published by Dr. Atcherley (1874). The chemical directions are very simple and good.

† "Milk Analysis." By J. A. Wanklyn. 1874.

The rule thus given by Wanklyn for the estimation of the added water depends entirely on the correctness of his datum, that 9·3 per cent. may be taken as a standard of "solids not fat." A Health Officer must ask himself, if he can maintain the accuracy of this standard supposing he goes into a court of law, and is subjected to cross-examination from a well-prompted lawyer. Certainly, the general opinion has heretofore been, that the solids of milk vary within greater limits than Wanklyn assigns. His defence of his position is as follows: in 10 analyses by himself of pure milk, obtained from dealers or procured by himself, the lowest amount of total solids was 11·8; the highest 14·07 (p. 35). In analyses carried on during a year by Müller and Eisensluch, for the Royal Agricultural Society of Sweden, it appears that 15 well-fed cows of different breeds gave an average of 12·8 per cent., the highest was 14·08, and only 4 times did the solids fall below 12 per cent. (Wanklyn, p. 35). Four analyses by Goppelsröder, which show a smaller proportion of solids, are criticised by Wanklyn, and set aside as probably incorrect. While thus considering this to be well-established (although it is not so absolutely) Wanklyn does not deny that possibly single animals may give abnormally poor milk, but he thinks when we are dealing with milk on the large scale, we are little concerned with such exceptional cases. With regard to this point, however, it must be remembered that Medical Officers of Health may have to deal with the milk from a single cow, or from two or three cows.

Admitting that well-fed cows, as a rule, will give milk containing 12·5 grammes of solids in 100 c.c., it seems clear that sometimes the solids run up to 13·5 or 14, or even in one analysis by Dr. Davies to 16·25. Consequently, in such milk water could be added, and would not be detected by Wanklyn's rule. Sometimes, also, though possibly not very frequently, the solids will fall to 11·8, and sometimes it is admitted by Wanklyn himself, in special cases, will fall below this.* Wanklyn's rule would then indicate the addition of water when none had really been added, and the evidence might break down on cross-examination.

Under these circumstances it seems to me that in a court of law, the standard of 9·3 per cent. of "solids not fat" would break down, and it appears safer to assume the possible minimum amount of total solids to be equal to 10 or perhaps 11 grammes in 100 c.c. of milk. No analysis of undoubted pure cow's milk has to my knowledge ever detected a less amount of solids than 10 grammes, and I think 11 is extremely rare. We should be then absolutely safe in calculating the addition of water from the standard of 10 grammes in 100 c.c., viz., that every deficiency of a gramme below 10 grammes in 100 c.c. implied the addition of 10 per cent. of water, and that conclusion could be maintained in the face of any cross-examination; we should also be practically safe in calculating it from 11 grammes. It may be said, however, that this rule would underrate, in many cases, the amount of water which had really been added. But this difficulty could be met by explaining to the magistrate that though the conditions of the problem cannot be made exact enough to enable a witness to swear that a larger quantity of water must have been added, yet that in the large majority of cases the solids of milk are not 10 or 11 but 12 per cent., and therefore there is always a great probability that the evidence is below the truth. And then if the magistrate thought it desirable—and he would, no doubt, often so think—the inspector could be ordered to obtain the milk direct from the dairy, and could take proper precautions against any water having been added. The analyst would then be able to determine the actual standard of solids for that dairy.

Of course future analyses may show that the solids in pure milk never are below 12 per cent.; a certain number of accordant analyses, say in 500 cows, made under different conditions of food, would probably be sufficient to prove this, and to enable the statement to be maintained in a court of law, but at present we have not got so many, and can only act in court on such evidence as is unassailable.

* Since this was written, Professor Voelcker has published ("Veterinarian," May 1874) analyses showing that the standard of 12·5 in 100 c.c. cannot be maintained, and he dissents entirely from Wanklyn's conclusion. On one occasion, in September, the solids sank to 9·3 per cent. instead of 12·5, and this was not the milk of a single cow, but of the evening milk of the whole herd.

Mr. Wanklyn discourages the plan of taking the specific gravity of milk, and no doubt, when it can be done, the determination of the solids by weighing is the best. But when the specific gravity is taken with due regard to temperature and amount of cream, it gives very useful information, and in many large establishments, such as hospitals and large cooking places, where daily evaporations and weighings could not be carried on, the specific gravity gives a most convenient control over the salesman, which it would be a pity not to utilise. If a specific gravity of 1028, at a temperature of 60°, and cream to the amount of $\frac{8}{100}$th is ensured, we shall at any time know that no great amount of water has been added.

With regard to cream, Wanklyn gives some interesting information; without pledging himself to complete accuracy, he finds that 0·2 grammes of fat = 1 gramme of cream; he finds the amount of water in cream varies from 50 to 72·2 per cent., and of fat from 19 to 43·9 per cent. The casein, sugar, and ash in cream vary from 5·63 to 14·77 per cent. As cream thus varies in composition he disputes the use of the "creamometer." He proposes to determine the casein in milk by means of his "albuminoid ammonia process," acting on 5 c.c. of milk in 100 c.c. of water, and proceeding as in water analysis; every part of casein gives ·065 parts of ammonia; 100 c.c. of milk give ·26 grammes of "albuminoid ammonia." The ash he puts as between ·7 and ·8 grammes in 100 c.c. of milk, and advises the determination of the ash as a control in suspected cases of watering.

Dr. F. N. Macnamara* has made a careful examination of milk in Calcutta. The ordinary lactometer is, he says, of doubtful utility, as it is graduated for 60° and not for 85° or 90°, the temperature of milk in Bengal. Nor does Vogel's lactoscope succeed much better, "owing to the rapid setting in of "coagulation by which the milk quickly thickens; at any rate this seems to "me the reason why, using Vogel's instrument, I have always greatly over-"estimated the amount of fat in the milk."

The "creamometer" also, he says, fails, as the rapid coagulation of the casein hinders the fat from rising.

He determines the total solids (5 grammes exposed to 212° for 3 hours) and then the ash.

The sugar he gets as follows:—"2 c.c. of the milk; 3 or 4 drops of acetic "acid, and 40 c.c. of spirits of wine; cork flask, shake thoroughly, stand 24 "hours, filter, and then wash residue on filter with 60 c.c. of a mixture of "equal parts of water and spirits of wine. Evaporate in a steam bath to "syrupy consistence. Dissolve in 100 c.c., and determine by Fehling."

Casein is determined by distilling with permanganate of potassium after Wanklyn and Nesslerizing.

Fat by evaporation to dryness of milk mixed with sulphate of lime, and exhaustion of the dried and powdered residue by ether.

The following are examples of the composition of milk selected from Macnamara's analyses:

Composition of Calcutta Milk.

	Bengali cows, best of 7 analyses.	Ditto, worst of 7 analyses.	General Hospital. Milk,	Bought in bazaar. Worst.
Solids	15·22	11·97	13·02	4·88
Casein	5·5	4·3	3·84	
Fat	4·98	2·52		
Sugar	3·98	4·37	4·16	
Ash	·76	·78	1·0	·28
Water	84·78	88·03		

These analyses show a very high per centage of solids, and especially of

* "Indian Medical Gazette," July 1, 1873.

casein. The fat, as in England, varies greatly, since both samples of milk were genuine, and one contained just 5, and the other only 2·5 per cent of fat.

The chemical analysis of milk, of course, requires to be supplemented by a microscopical examination if all conditions of quality are to be determined, and at the present time it seems as if the method of investigation were becoming too exclusively chemical. Dr. John Ogle* has given an analysis of a paper on Condensed Milk Factories in the "Agricultural Journal,"† bearing on this point, and has added some facts of his own, and the subject is so important that a quotation from Dr. Ogle's paper will be useful :—

"Dr. Willard (of the Cornell University) describes in detail the liability of milk, "as discovered in Mr. Borden's earlier experiments, and also according to the ex- "perience of the present day, to a 'peculiarly bad behaviour,' 'refusing to be con- "'trolled,' in spite of all due care and caution as respects cleanliness—a point which, "in the manufacture of condensed milk, has especially to be attended to, as the "success of the condensing factory depends entirely on the milk being fine-flavoured, "and clean and healthy, free from drippings of the stable, &c.; and he alludes to "investigations of Hallier and Pasteur on the change in milk wrought by living "organisms, as from cesspools, decomposing and putrid animal matter, &c. He "then quotes from Prof. Caldwell, who speaks of the germs of fungi thrown off from "putrefying matter being mixed with the air, and thus inhaled by cattle, whose "milk becomes in consequence infected before it leaves the bag.‡ He afterwards "alludes to the discovery by Mr. Foster, of Oneida, that milk from cows which in- "haled bad odours and emanations from decaying animal remains was rendered "unfit for making cheese; and not only was the milk from the cows which inhaled "the odour unfit for cheese-making, but also the milk from a large number of *other* "cows which had been mingled with the former in the cheese-factory vats. He speaks "of numerous cases where milk was tainted from the cows having passed through "sloughs of decomposing vegetable matter, the particles of dirt which adhere to the "udders and other parts of the animal falling into the milk during the process of "milking, and introducing germs, which quickly decompose and putrefy good "healthy milk. He mentions instances illustrating this, and describes the trouble "which happened in the case of a large factory supplied by numerous farms or "milk-walks, in one only of which it was found that the cows were allowed to cross "a narrow slough where particles of mud adhered to the udder. But the facts "which I particularly wished to quote are the following. They happened in the "experience of Professor Law, of Cornell University, who obtains his supply of milk "from a 'milkman.' 'One day during the hot weather he observed a peculiar ropy "'appearance in the cream which had risen on the milk. He examined it under "'the microscope, and found it filled with living organisms of a character quite "'foreign to good milk. He immediately called upon his milkman to inquire con- "'cerning his management of stock and general treatment of milk, with a view of "'accounting for the trouble. There was no fault discovered at the dairy, in the "'milking, or in the treatment of the milk; but on looking through the pastures, "'he found that the cows, for lack of clean running water, were compelled to slake "'their thirst for the most part from a stagnant pool. This water he examined "'under the microscope, and discovered in it the same class of organisms as those "'in the cream. He then took some of the *blood* from the cows and examined it "'under the microscope, when the same organisms made their appearance. He "'next obtained a specimen of good milk—milk which on examination was free "'from impurities—and into this he put a drop of water from the stagnant pool. "'In a short space of time the milk developed an infinite number of these living "'organisms, and became similar in character to the milk obtained from his milk- "'man. He examined the cows, and made the usual thermometric tests for deter- "'mining health and disease in animals. The cows were found to be hot and

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* "Lancet," October 11, 1873.

† "Journal of the Royal Agricultural Society," No. 15, 1872.

‡ "As an illustration of the effects of inhaling air containing putrid matter, I "may mention that when I was curator of the St. George's Hospital museum, the "man who had to cover the preparations with bladder, which was used when in a "state of commencing putridity, invariably at that time became subject to diarrhœa, "and the fæces and the flatus from the bowels and from the stomach always had "the same peculiar offensive smell which the putrid bladder possessed."

" ' feverish, thus evidently showing that the organisms entering the circulation had " ' affected the health of the animals.' "

The facts stated above are of importance far beyond the effect on the manufacture of milk. They show the influence of water swarming with organisms in a much clearer way than can be obtained in cases in men. From drinking the water of these stagnant pools the cows were made feverish; and delivered milk containing the same organisms as the water; and, as when a drop of this stagnant water was put into good milk the organisms developed in infinite number in a short time, it can scarcely be doubted that they did not merely pass in a living state through the body of the cows, but must have grown there, and thus caused the feverishness. We have, in fact, an instance of these small organisms giving rise to fever and passing off with a secretion. It seems to me a pathological fact of moment, and we may be sure that the same thing will occur in other animals.

Butter.

The examination of butter has given rise to much controversy during the last two years. The point of dispute is not as to amounts of water and salt which are contained in the butter, nor as to the presence of starch or membrane, all which are points easily determined, but as to the admixture of foreign fats. As all these fats contain, in common with butter, stearin, olein, palmitin, margarin, &c., the chemical determination is difficult if not impossible, and Wanklyn in fact concludes* that, "with regard to the question of " admixture of foreign fats, we are unable, in the present condition of our " knowledge, to deal with that part of the problem."

This conclusion is perhaps too absolute, since some information can be obtained by considering the melting-point and by the microscopical examination. A paper on butter was lately read by Dr. Tidy, before the Association of the London Medical Officers of Health, and the following extract† gives a good summary of the main conclusions :—

" Water might, and often does, become a very serious adulteration. The method " of determining the proportion of water in a sample is to place 100 grains of butter " in a capsule and expose it to a heat of 220° for several hours, the loss in weight " being the proportion of water. An examination of twelve samples of undoubtedly " good butter gave a range of from 5 to 8 per cent. of water. It is also incorporated " by the butterman, by beating and other manipulations; in some cases as much as " 28 per cent. had been added. Analysis of 130 samples purchased at different shops " gave the following proportions of water :—five, 25 per cent.; seven, 7 to 9 per cent.; " twenty-one, 9 to 10 per cent.; thirty-four, 10 to 13 per cent.; forty-two, 14 to 17 " per cent.; seventeen, 18 to 24 per cent.; and four, 25 per cent. and over. When " called upon to give certificates for production before a magistrate, he made a rule " of stating the quantity of water when above 10 per cent. Salt he detected by " burning the remainder of the 100 grains of butter and weighing the residue. In " twelve samples the average was 5·2 per cent. The result of twenty-seven experi- " ments was—in two, under 3 per cent.; two, between 3 and 4 per cent.; three, " between 4 and 5 per cent.; four, between 5 and 6 per cent.; twelve, between 6 " and 7 per cent.; and one, between 7 and 8 per cent. Over 7 per cent. he con- " sidered an excessive amount of salt. In the cases of both salt and water, the pro- " portions are always stated on the certificate, and the magistrate left to draw his " own conclusions. The melting-point he had found an important means of testing " the purity of samples of butter. He fills a test-tube about three parts full of " butter, and adds small quantities of boiling water, carefully noting, first, the " melting, then, as it cools, the solidifying-point. Ten samples of good butter gave " an average melting-point of 75°, and solidifying-point of 63°. Four samples of " beef dripping gave an average of 52½° as the solidifying-point, and 79° as the " melting-point; four of lard, 75° and 82°. A great deal of information might thus " be gained from the careful study of the melting-points. Taste, smell, and ap- " pearance also afford a valuable, because ready, means of detecting adulteration. " First, as regards taste. The buttery taste is very persistent, and may be detected " when only one part of pure butter is present in fifty. When placed upon the

* "On Milk Analysis," p. 54.

† "Medical Times and Gazette," Feb. 14, 1874.

" tongue, pure butter melts quickly, and leaves it perfectly smooth. If adulterated, " the butter melts more slowly, but always before the adulterant, the peculiar taste " of which is invariably noticed towards the end of the experiment. Other fats " give the specimen a granular taste, leaving a slight roughness on the tongue. The " peculiar and characteristic odour of butter had been found to prevail even when " the samples had been very largely diluted. It is well not to attempt too much " smelling and tasting in one day, as these senses soon become tired and not to be " trusted to. Perfectly pure butter is generally of a rich yellow colour and uniform, " not having a mottled or streaky appearance. A clean knife passed rapidly over " pure butter does not produce either of these conditions. Impure butter is gene- " rally pale and marbled, while streaky butter should always be looked upon with " suspicion. He had melted a quantity of from 500 to 700 grains of butter in a " beaker with distilled water. When hot it had a fine cellular appearance; cold, it " formed a soft solid, of uniform consistence. The upper surface was always more " transparent than the lower, and beside perfectly smooth; the under surface being " more or less irregular. This should always be carefully noted. Another charac- " teristic of pure butter is its tendency to participate in the slightest movement of " the water in the beaker in which it has been melted and allowed to cool. Impure " butter does not show this peculiarity—seeming to stick to the side of the vessel. " When emptied out on to a sheet of blotting-paper, it falls as a wet mass, with a " regular outline, and greases the whole of the paper. Adulterated specimens form " irregular cakes, and leave the paper drier, and not so much greased. Another " means of detecting adulteration by the melting-point was mentioned. Twenty " grains of butter are placed in a test-tube with two drachms of ether, and kept at a " temperature of 65° (the melting-point of butter) for ten hours, after which the " ethereal solution of fat is filtered, and the filtrate carefully evaporated to dryness " in the water-bath, and weighed. This gives the percentage of fat. The percen- " tage of water, ash, and fat added together, and then substracted from 100, gives " the percentage of organic matter, not fat, in the butter. This in pure butter is " always small. Ten samples were experimented with, the result being no deposit " in eight cases, and only a very small deposit in the other two. With four speci- " mens of lard the deposit averaged 3 per cent., and five of beef and mutton suet " gave a mean of 5·7 per cent. Examined with the microscope, pure butter had no " polarising action, and no crystals could be detected, while crystals of stearine " were found in abundance in some specimens in which lard was used as an adulte- " rant. The analysis of fatty matters would be found very difficult, and perfection " could only be arrived at by constant practice."

With regard to crystals in butter, Professor Anderson of Glasgow, in his Report on a sample of butter which was considered to be adulterated, speaks in doubtful terms of the value of this character. He says, that "nothing is " easier than to make pure butter assume a completely crystalline character " under the microscope." He adds, that he is "by no means certain that " genuine butter, when kept for a long time, may not to a certain extent " acquire a crystalline character." The words "to a certain extent" make this passage vague; either there are crystals, or there are not; or does it mean that the crystals are only few? Dr. Campbell Brown has kept butter for many months without finding any crystals. The chief ambiguity or difficulty is that the added fats do not always contain crystals, so that the appearance is only an aid when it occurs.

There is no doubt that the processes for the detection of foreign fats in butter are very imperfect, and that in coming to any conclusion great caution must be observed.

In the discussion which followed Dr. Tidy's paper, Dr. Bernays states, that in one sample of butter be found 5 per cent. of potatoes: the detection of this would be quite simple. All agree that the quality of butter is best judged of from taste and smell, and it may be said that the smell and taste of the melted and then recongealed fat is the best mode. It would appear, from an interesting letter in the "Times" of January, 1874, from a practical dairy-woman, that apart from flavours arising from food or carelessness in churning, the badness, of genuine butter arises from the cream being allowed to turn sour before churning.

Tea.

Much interest has been caused by various analyses of tea, and from actions

at law based on them. The immediate cause appears to have been the importation into England of a large number of cases of damaged and partially putrid black tea, some of which found their way into the market. Subsequently proceedings were taken against various retail dealers for selling adulterated green tea, *i.e.*, tea faced with various mineral substances, and mixed also with what is termed "lie-tea." It was also asserted that black tea had been largely adulterated, and especially with iron filings, but this was subsequently shown to be erroneous in most cases, though in some it appears that some magnetic iron ore had really been added. The result of all these circumstances was to cause a great agitation among the retail dealers in tea since they found themselves liable for tea which they had bought from the wholesale houses in good faith as pure tea.

With regard to damaged and putrid tea, the retail dealer can plead no excuse, for this condition is evident on a very cursory examination. Even before any manipulation there may be a peculiar odour, and when the infusion is made it is found to have lost all tea fragrance, to have a disagreeable smell and a bitter, nauseous taste. If further examined, and if a little of the tea is rubbed with pure water, the microscope shows the fluid to be swarming with vibriones; if the smell and taste of the infusion are sufficient without the microscopic test, it is only demanding ordinary care in buying from the retail dealer if the onus of examining samples before purchase is put upon him.

The case of green tea is different; for many years, as shown long ago by Hassall, the Chinese have coloured their tea with prussian blue and indigo for the English market. This falsification has been a matter of notoriety, and perhaps no tea-dealer in England has sold unfaced green tea. The "lie-tea," the little pellets of which consist, as Hassall has lately shown, in great part of boiled starch, binding together a little tea and sand, would not be very readily detected by a retail dealer, but on the large scale the merchant could easily find means to discover it, and he might be called in by the retail dealer to certify to the freedom of the tea from "lie-tea." It certainly at first seems hard on the retail dealer to punish him for a falsification which custom has half condoned, or to demand of him a knowledge of methods of examination which are outside his training. But in what other way can the evil be checked? and after all the retail dealer can demand a guarantee from the wholesale firm.*

The statement that either green or black teas are extensively adulterated with iron filings was based on a curious observation. Some tea was found to be largely attracted by the magnet, and this was attributed to the presence of iron filings; but a very exhaustive enquiry before the stipendiary magistrate at Birmingham, brought out the fact that, in the case referred to, the attraction was owing to small particles of magnetic iron oxide, or magnetic iron ore of some kind, which had become accidentally imbedded in the tea. In other cases it would appear† that the amount of magnetic oxide, and of sand mixed with it, has been too large to be accounted for in this way, and it is assumed that it must have been fraudulently added. In one sample of green tea, Mr. Bell, of the Laboratory, Somerset House, found no less than 20 per cent. of quartz and 8·6 of magnetic oxide ("Chemical News," February 27th, 1874, p. 100), and Dr. Campbell Brown, of Liverpool, has also detected a considerable amount. To determine the presence of the magnetic oxide, the tea is spread out on a plate and a magnet drawn through it; if nothing adheres, the tea is powdered, again spread out on a plate, and the magnet passed through it once more. If anything adheres, it is collected and weighed and further examined chemically.

The various analyses have not brought out any new methods, but it may perhaps be useful to pass briefly over the several points in the examination of tea. It must be borne in mind that two points are involved in the examination; first, the detection of adulterations or fraudulent treatment of tea, as by using exhausted leaves; second, the determination of the quality of the tea. The first point is determined easily by any experienced person;

* Since this was written, the Judges have decided, on appeal, that facing tea with prussian blue or other substances is an adulteration.

† Letters from Mr. Thompson and Mr. Allen in "Chemical News," Dec. 12, 1873.

the second is far more difficult, and as it is settled almost entirely by taste and smell, it requires constant education of the senses, which no one but a regular teataster has. Consequently, it is always best for the analyser to be cautious in giving an opinion as to quality when the samples resemble each other, although, of course, he can easily distinguish between very good and very inferior tea. Questions of quality and price, however, do not come before him so frequently as those of adulteration; but if they arise, as will often be the case in the army or navy, a known tea should be taken as a standard and compared with that which has to be examined. I subjoin some instructions which I hope may be useful.

Scheme for the Examination of Tea.

1. Judge of the aroma of the tea before manipulation.

2. If it be black tea, spread it on a white plate and examine with a pocket lens. The leaves, stalks, and flower buds will be seen quite clearly; large particles of sand, if they are present, will be also seen. Most of what appears to be dust to the naked eye will be seen by the lens to be merely portions of leaves, but probably there will be some dust, the true nature of which is not seen by a pocket lens; collect this fine dust, put some of it on a glass slide, moisten it with a drop of hot water and examine with a power of 100 to 200 diameters. I have found that many samples of what looked, to a lens, like extraneous dust, was proved to be merely little portions of leaf, or the hairs from the leaf, which are very common. If not leaf or hairs, this fine dust may be either fine sand, or quartz, or mica (sometimes) or iron oxide, or magnesia, or clay. If any of these are found the tea should be passed through a fine sieve, the fine dust soaked in hot water, all bits of leaf picked out, and after thorough washing the residue should be again looked at with the microscope to see that it is clear of leaf, and be then dried, incinerated and weighed.

A magnet should be applied to another sample of tea, and if nothing is attracted the tea should be powdered and the magnet used again.

If the tea be green tea a certain number of the rolled up leaves should be picked out, and also all the little pellets which under the lens are not like tea; they should be separately steeped in hot water, and all particles from the true leaves collected and examined for indigo, prussian blue, chalk, magnesia, &c. The little pellets when softened should be examined under the microscope and tested with iodine, and if they are "lie-tea," the characters of starch, sand, &c., will be easily determined.

In making this examination the relative amount of unbroken and broken leaf, stalk, tea dust, or extraneous dust, and the nature of the added dust can be readily determined.

3. Make an infusion of 2 per cent., that is 2 grammes with 100 c.c. of distilled water (or 30 grains in 3½ fluid ounces); pour the boiling distilled water on the leaves in a flat dish and smell the aroma at once, and while the infusion gradually cools; compare with a similar infusion of a known tea. I have found the strength of 2 per cent. gives a sufficient amount of aroma without giving too much to destroy the acuteness of the sense. When the infusion has cooled pour it off and boil the leaves in successive portions of distilled water until the water comes off clear. Filter and measure amount of infusion and evaporate in a steam or water-bath a certain amount to dryness; calculate out the amount of solids dissolved from the quantity of tea used. This process will detect readily if the leaves have been previously exhausted; it is of little use as to quality, for inferior teas give as much off to water as fine tea, and, indeed, in some cases more. I found black tea at 1*s.* 9*d.* per lb. gave off 36·31 to water, and tea at 3*s.* 4*d.* per lb. gave off 29·77 per cent.

4. After exhaustion with water, spread out the leaves and examine for structure and the presence of foreign leaves.

5. Determine the ash by incinerating 2 or 5 grammes in a platinum dish without adding acid. The ash when properly burnt is greyish; after weighing it should be boiled in water, filtered; the filtrate evaporated in a steam bath and weighed. This process is also of no use in judging of quality, because the amount of ash is not very different in fine and inferior black teas (if anything it is less in the fine teas), but it is important as showing the amount of added or extraneous mineral substance, or whether the leaves

have been exhausted. The ash of true tea is seldom more than 6 per cent. of the undried tea, so that any added mineral is easily detected. In exhausted leaves the ash may fall to 3 per cent. With regard to the amount of ash, Wanklyn has given the following statement.*

	Percentage of ash
"Specimen of tea used by myself	5·63
"Civil Service tea	5·56
"Horniman's tea	5·99
"Mandarin's tea, 8*s.* per lb.	5·30
"Orange Pekoe, 5*s.* per lb.	5·84
" Do. do.	6·06
"Green tea, 4*s.* 6*d.* per lb.	5·86
"Average	5·75

"These determinations were made on tea in its ordinary air-dried condition, "and agree sufficiently with Zöller's. The proportion of ash in absolutely "dry tea is 5·92 per cent."

The amount of soluble ash is given by Wanklyn as about 3·5.

The following table is given by Mr. Wilson,† and shows the amounts of total ash, that soluble in water by hydrochloric acid, and also the quantity of silica and oxide of iron normally present in tea.

In the following table A represents the per centage of ash; B, the proportion of the ash soluble in water; C, that soluble in hydrochloric acid; D, the siliceous matters; and E, the amount of peroxide of iron in the ash.

	A.	B.	C.	D.	E.
1. Moning	6·00	3·15	2·03	0·82	0·05
2. „	5·82	2·73	2·52	0·57	0·07
3. „	5·90	2·76	2·36	0·78	0·07
4. „	5·55	2·66	2·21	0·68	0·09
5. Kaisow	5·43	3·33	1·88	0·22	0·05
6. Foochow Pekoe	6·15	3·20	2·16	0·79	0·09
7. Assam Souchong	5·15	2·90	2·05	0·20	0·03
8. Green Assam	5·32	2·94	2·11	0·27	0·08
9. Fine Green tea, faced	7·14	2·38	3·19	1·57	0·12
10. Black tea, mixed	5·68	2·86	2·33	0·49	0·04

I have made analyses of the ash of 8 kinds of black tea sold retail at different prices, and the results can be compared with the above. I give also the price to show the relations of price to ash, and it will at once be seen that the ash affords little guide as to quality.

Analyses of Eight kinds of Retail Black Tea, in 100 *parts of Undried Tea.*

No.	Price per lb.	Total ash.	Soluble.	Insoluble.	Phosphoric acid in soluble salts.
	s. *d.*				
1 ..	3 4	4·90	2·23	2·67	·179
2 ..	2 10	5·10	2·60	2·50	·200
3 ..	2 6	5·54	2·30	3·24	·148
4 ..	2 4	5·60	2·80	2·80	·203
5 ..	2 3	6·26	2·74	3·52	·253
6 ..	2 0	5·97	2·59	3·38	·203
7 ..	2 0	5·70	2·40	3·30	·185
8 ..	1 9	6·49	3·25	3·24	·297

* "Chemical News," Oct., 1873, p. 187.
† "Chemical News," Dec. 19, 1873.

The mean of the ash was 5·695; of the soluble salts, 2·614; and of the insoluble, 3·081. The ash seemed largest in the worst teas, but this was not greatly marked.

6. Determine the amount of tannin.—This is important, as showing whether the leaves are exhausted, or, on the other hand, whether catechu has been used; but it is not easy, as there are both tannin and gallic acids, and the latter ought to be also determined. The tannin is precipitated by gelatine and weighed. The process is very tedious, and many other plans have been proposed. One of the simplest is by Mr. Allen,* who uses a volumetric solution of gelatine, which is thus prepared:—40 grains of "Nelson's gelatine" are dissolved in 16 fluid ounces of distilled water, to which 15 grains of powdered alum is added, which much facilitate the precipitate of tannic gelatine; 5 grains of pure tannin are dissolved in 6 ounces of water, and the strength of the gelatine solution is determined. To determine the tannin in tea, Mr. Allen takes 20 grains of tea, and boils it for half an hour in 3 or 4 ounces of distilled water; pours off the liquid, boils in a little more water, and then on cooling makes up the liquid to a given quantity; he takes $\frac{1}{10}$th of this solution (= 2 grains of tea) mixes with an equal quantity of water, and adds the standard solution of gelatine; a precipitate of tannate of gelatine occurs, which readily settles, and when this seems completed, a small quantity of the liquid is filtered into a test tube and a little more solution of gelatine is added; if there is any precipitate, the liquid is put back, and more gelatine is added until the process is completed. Then the remainder of the solution of tea is taken, and the process repeated on it so as to get a control. As the strength of the gelatine solution has been previously determined, the calculation of the amount of tannin in the 20 grains of tea is easy. Mr. Allen finds the amount to be about 15 per cent. in black tea, whereas in exhausted tea leaves it is not more than 3 to 4 per cent. In green tea it is about 18 to 19 per cent. This method, however, is not considered accurate by Mr. Estcourt,† who thinks the amount of tannin is underestimated, and he prefers a modification of the plan with gelatine and potassium permanganate. But Mr. Allen's process is sufficient to show whether the tea-leaves have been exhausted.

In the eight samples of black tea of different prices which I analysed, I determined various points to see if any indications as to quality could be obtained. Thus the infusion of tea is slightly acid; I determined, therefore, the acidity of all the infusions by neutralization with standard soda, but found no difference between the best and the worst teas. The ash is alkaline; so I determined the alkalinity, which ranged from an amount equal to 0·389 grammes of caustic soda in the ash of 100 grammes of undried tea, to 0·225 grammes. But the alkalinity of the ash of the worst teas and of the best teas was nearly the same, viz., equal to ·279 and ·302 grammes of soda. The determination of the thein is known to give no clue to quality, but I thought the total nitrogen might do so, but here, too, the results were indecisive; tea at 3*s.* 4*d.* per lb. gave 4·129 grammes of nitrogen in 100 grammes of undried tea; while in tea at 1*s.* 9*d.*, 3·275 grammes only were given; yet an excellent tea at 2*s.* 6*d.* gave almost the same as this, viz., 3·204, so the nitrogen is no guide. In fact, it appears that the taste and smell of the infusion and the physical examination of the tea are the only safe guides to quality.

Alum in Bread.

Several actions have taken place during the last year under the Adulteration Act, and some considerable discrepancies of chemical evidence have occurred. This has not been on the part of medical men just appointed Health Officers, and who might not be at first expert in what is really a difficult chemical process, but it has happened in the case of chemists of great reputation. Alum has been found in bread by some, and denied by others. Analysts have been tested by bread being mixed with alum and sent to them,

* Paper read at the Meeting of the British Association, at Bradford. "Pharmaceutical Journal," October, 1873.

† "Chemical News," March 6, 1874.

and none has been found; bread has been made with pure flour and alum has been found. In the courts, chemical exceptions have been strongly urged, and a summons has been dismissed when even supported by first-rate chemical evidence. The reasons of these discrepancies are sometimes obvious; if the baker used powdered alum, instead of dissolving it in water, a portion of a loaf may have a great deal, others none at all. Even if alum water is used, unless care is taken to dissolve the alum in all the water used, one part of the loaf may be more strongly impregnated than another. Consequently, as the amount of alum used is small (say 10 grains of crystallized alum to 1 lb. of bread, corresponding to little more than 1 grain of alumina); if only a small quanity of bread is taken, no alum may be detected in that particular portion. The objections taken in the courts of law have been—1. The possibility of the re-agents containing alumina. This objection can be avoided by using small quantities of the re-agents, as suggested by Wanklyn, and also by invariably making a blank experiment at the same time. 2. The possibility of alumina being added by the vessels. This objection was taken in a case in which Mr. Redwood found alum and Mr. Wanklyn did not; the former having used porcelain vessels, the latter platinum; the chances of alumina being thus added are very small. To obviate any chance of this legal objection being raised, platinum vessels should be used; or, if these cannot be obtained, a blank experiment must be made with similar porcelain vessels, so as to give, as far as it can be done, a reply to the objection. 3. The possibility of alumina being present in the salt used in baking. It seems impossible to deny the possibility, but the amount of alumina must be so trifling it can be neglected.

With regard to the process for detecting alum in flour and bread, Wanklyn has proposed a considerable modification of Kuhlman's process with nitro-hydrochloric acid, which is that usually followed. He uses sulphuric acid and avoids dilution.* This process appears to answer well for flour, but it has been stated by Mr. Jones of Wolverhampton,† that it is not proper for bread, as a fallacy is caused by the chloride of sodium used in bread-making; when the ash of bread containing sodic chloride is treated as directed with sulphuric acid, fumes of hydric chloride are evolved, and chloride of aluminum also escapes, according to Mr. Jones, so that he found no trace of alum in a four-lb. loaf to which 2 grammes (30·8 grains) had been added, by Wanklyn's method, while the usual method with hydrochloric acid detected it.

Wanklyn has replied to this, that he used dilute sulphuric acid; but then, as the evaporation has to be continued until acid fumes are driven off, the acid would become concentrated, and the same condition would be produced as if the concentrated acid were added. As soon as hydrochloric acid fumes begin to come off, more water must be added.

Another point which has been raised before the magistrates is that the precipitate obtained and weighed is not alumina, as is usually considered, but is a phosphate of aluminium, and therefore, if any calculation is based on it as alumina, the amount of alum in the bread is over estimated. As the precipitate is undoubtedly in part or altogether a phosphate, the phosphoric acid must be got rid of, by the usual process with tin, or the calculation may be based on the precipitate as phosphate ($Al_2O_3P_2O_5+3H_2O$), 1 part of the precipitate being taken to contain ·344 parts of alumina. But as the water in the phosphate varies, this calculation is not perfectly exact.‡

On the whole, it seems preferable to adhere to the old method of testing; to use only platinum vessels, or, if only porcelain can be got, to make careful blank experiments with pure bread, and in every case to repeat the experiments on a second portion of the alumed bread.

Cystic Parasite in Sheep.

Surgeon-Major Oldham§ describes a Cysticircus (C. tenuicollis, from the

* See Hart's "Manual of Public Health," p. 348. Also the page of corrections and additions in the fourth edition of my "Manual of Hygiene."

† "Chemical News," Feb. 27, 1874, p. 101.

‡ Dr. Dupré has lately proposed another process in which the alumina weighed as phosphate.

§ "Indian Med. Gazette," August, 1873.

Tænia marginata of the dog), which is very common in sheep in the Punjab. There are 4 suckers and a double coronet of hooks, 32 in number. They are most common in the omentum, liver, lungs and intermuscular tissue, but are sometimes imbedded in the substance of the muscles. This is perhaps the same cysticircus described by Cobbold some years ago in the sheep.

II. Air.

(*a*) *Solid Floating Bodies in Air.*

Two important contributions to our knowledge of the corpuscular floating bodies in the air have been published in the year. The first is contained in Mr. Blackley's excellent work on Hay-fever.* Mr. Blackley, who, fortunately for science, though not for himself, suffers from hay-fever, has made a number of most conclusive experiments on himself, with benzoic acid, coumarin, various odours, ozone, dust, pollen, and light and heat, and the result was unquestionably that the cause of hay-fever is dried pollen from many different kinds of plants, but especially from the grasses,† floating in the air, and then received on the mucous membrane of the nose and throat, and then swelling out and producing mechanical irritation, and possibly chemical irritation also by some substance discharged from the grain when it bursts.

In pursuance of these experiments, Blackley found it necessary to enquire what quantity of pollen can be found floating in the air at ordinary and at high altitudes. He collected the floating particles in various ways, but finally adopted the most simple plan, viz., exposing slips of glass to the open air for a given length of time, so as to allow any solid matter in the air to deposit on them; a cell was made on each slip, and coated with a fluid made of 1 part of water, 2 of proof spirit, and one of glycerine; 5 grains of pure carbolic acid were dissolved in each ounce of this liquid; 4 slips of glass were exposed to the 4 cardinal points, and the number of pollen collected in a given time were counted. From early in May until nearly the end of September pollen was found in the air, and in this country 95 per cent was from the graminaceæ; the amount varied, but was often considerable; the greatest mean amount collected was on the 28th of June, when 880 pollen grains collected in 24 hours on a superficies of 1 square centimetre; the greatest absolute amount on one of the slides was 1,260, which is equal to 7,870 pollen grains on 1 square inch; and from this date the amount fell on either side with however many variations on the different days, owing especially to rain and temperature; heavy rain and low temperature lessened the amount; gentle rain and high temperature increased the amount, by detaching and allowing the pollen to become separated. The average amount of pollen for the whole season was 24 grains for 1 square centimetre. In the air of the house pollen was found in much less quantity.

At high altitudes (400 to 1,000 feet) air was examined by sending up kites, and the results were that much more pollen was found in the higher strata; on an average 19 times as much. There were also in every case spores or germs of some kind.‡ It will be seen, therefore, that these investi-

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* "Experimental Researches on the Causes and Nature of Catarrhus Æstivus," by C. H. Blackley, M.R.C.S. Eng., 1873.

† An incidental observation may be noted. While experimenting with fungi (which never brought on true hay-fever), Blackley found (p. 58, foot-note) that on inhaling the spores of *Penicillium glaucum* a severe attack of hoarseness, going on to complete aphonia, was brought on. This went on for a couple of days, and ended in a sharpish attack of bronchial catarrh. He thinks this rather interesting in corroborating Salisbury's statements about the mycelium on damp straw producing measles.

‡ Mr. Blackley says—"The number of spores and germs of all kinds combined "was often so great that it was very difficult to form a correct estimate of the "quantity. If the advocates of spontaneous generation who call so persistently for "proofs of the existence of large numbers of germs in the air will adopt the plan "followed in these observations, they will have no lack of evidence that they are at "times present in very large quantities. In one experiment, which lasted about "four hours, and in which the number of pollen-grains collected at an altitude

gations of Mr. Blackley have an importance beyond even the disease whose production they so well explain.

The second work referred to is not less important, though no such definite conclusion is come to. It is an essay by Dr. D. D. Cunningham (now employed by Government in the investigation of cholera in India), on the floating bodies in the air in India.* The experiments were carried on within the precincts of two large gaols at Alipore (near Calcutta) and the Presidency Gaol. The observations were 59 in number from February to September, 1872. An apparatus was employed resembling that of Maddox, and the microscopic powers were from 400 to 1,000 diameters. The most frequent particles were "silica, amorphous granular masses, carbon, lime, starch cor-" puscles, cells, hairs, and other fragments of vegetable tissues, fibres of " cotton, &c., hairs and scales of insects, oil globules, pollen grains, spores, " and cells of fungi and algæ. Among the rarer constituents were acari, " specimens of which occurred in four preparations; they were more or less " disintegrated in most cases. Distinct bacteria were observed in one or two " instances only, and then in very small quantities; but all the preparations " abounded more or less in minute monad-like molecules and globules of an " undefined nature. Bodies which could be supposed to represent or belong " to the higher infusoria hardly ever occurred" (p. 27). Pollen grains were present in 52 of the 59 preparations, and were especially from the grasses. Spores were of constant occurrence, and generally in considerable numbers. Very beautiful coloured drawings (59 in all) are given, showing the *find* on each day; they are admirably done.

No connection could be traced between those floating particles and diseases in the gaols, but during the whole time there was scarcely any cholera.

Besides these observations, Dr. Cunningham made several other miscellaneous aëroscopic observations (28 in number in 1871 and 1873) in different other situations. Numerous bodies were found; bacteria were not common, but were found, and a curious spirillum of considerable size and of greenish colour was caught. There were numerous minute bodies of undetermined nature, "resembling those included by Robin, under the term Micrococcus."

Observations were also made on bodies deposited on leaves, ledges, moist glass slides, in dew and in rain-water. Dr. Cunningham discusses all these points with great care, and makes many valuable observations on the bacteroid bodies.

He then gives the observations on the air in the sewers of Calcutta. Eight experiments were made; the common coarser constituents of dust in the form of silica were less common, but oily matter was present in considerable quantity, and distinct jointed bacteria were found in four out of eight examinations; there were constantly present greenish cellules, taken to be the spores of aspergillus, and a great quantity of fine molecular matter. With regard to bacteria, their great prevalence in sewer air makes him think that Cohn's remark may be true, viz., that it is not that they are not present in atmospheric air, but that they are not recognizable, because it requires that a large quantity of watery vapour shall be present in order that they shall present their characteristic appearance.

Dr. Cunningham then gives his conclusions, which I copy *verbatim*.

"1. The aëroscope affords a very convenient method for obtaining specimens " really representing the nature of the true atmospheric dust.

"2. Specimens of dust washed from exposed surfaces cannot be regarded as fair " indices of the constituents of atmospheric dust, since they are liable to contain " bodies which may have reached the surface otherwise than by means of the air, as " well as others which are the result of local development.

"3. Specimens collected by gravitation also fail to indicate the nature and amount

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" of 1,000 feet was over 1,200, the spores of one of the cryptogams were so numerous " that I could not count them. At a rough estimate, there could not have been " fewer than 6,000 to 7,000 on the slide (= 30,000 to 40,000 to the square inch)."

* "Ninth Annual Report of the Sanitary Commissioner with the Government of India" (Appendix A. "Microscopic Examinations of Air," by D. D. Cunningham, M.B.).

"of organic cells contained in the atmosphere, as the heavier amorphous and inor-
"ganic constituents of the dust are deposited in relative excess, due to the method
"of collection.

"4. Dew also fails to afford a good means of investigating the subject, as it is
"impossible to secure that all the bodies really present in a specimen of it should
"be collected in a sufficiently small space, and moreover because it is liable to acci-
"dental contaminations, and also affords a medium in which rapid growth and de-
"velopment are likely to take place.

"5. Distinct infusorial animalcules, their germs or ova, are almost entirely ab-
"sent from atmospheric dust, and even from many specimens of dust collected from
"exposed surfaces.

"6. The circomonads and amebæ appearing in certain specimens of pure rain-
"water appear to be zoospores developed from the mycelial filaments arising from
"common atmospheric spores.

"7. Distinct bacteria can hardly ever be detected among the constituents of at-
"mospheric dust, but fine molecules of uncertain nature are almost always present
"in abundance; they frequently appear in specimens of rain-water, collected with
"all precautions to secure purity, and appear in many cases to arise from the myce-
"lium developed from atmospheric spores.

"8. Distinct bacteria are frequently to be found amongst the particles deposited
"from the moist air of sewers, though almost entirely absent as constituents of
"common atmospheric dust.

"9. The addition of dry dust which has been exposed to tropical heat, to putres-
"cible fluids, is followed by a rapid development of fungi and bacteria, although
"recognisable specimens of the latter are very rarely to be found in it when dry.

"10. Spores and other vegetable cells are constantly present in atmospheric dust,
"and usually occur in considerable numbers; the majority of them are living and
"capable of growth and development; the amount of them present in the air ap-
"pears to be independent of conditions of velocity and direction of wind, and their
"numbers are not diminished by moisture.

"11. No connection can be traced between the number of bacteria, spores, &c.,
"present in the air and the occurrence of diarrhœa, dysentery, cholera, ague, or
"dengue, nor between the presence or abundance of any special form or forms of
"cells and the prevalence of any of these diseases.

"12. The amount of inorganic and amorphous particles and other débris sus-
"pended in the atmosphere is directly dependent on conditions of moisture and
"velocity of wind." (P. 53.)

Of these conclusions, No. 11 appears to be too absolutely expressed, considering the small amount of evidence brought to bear on the connection between the several diseases named and *floating* atmospheric bodies. The whole paper is, however, excellently done and most valuable.

(*b*) *The Inhalation of Gases and Vapours.*

In the Report for 1872 I noticed the publication of the 1st part of Hirt's work "On the Diseases of Artisans," which dealt with the morbid conditions caused by dust inhalations. In a 2nd part, Hirt* discusses the affections resulting from gas and vapour inhalations. In the case of dust inhalation, Hirt distinguished two sequences; sometimes the dust produced conditions similar to those which follow other causes; sometimes it gave rise to effects which no other cause can produce. For example, the dust of coal may either favour the production of a common catarrh, or produce a special disease, anthracosis. With gases it is otherwise; they never cause a special affection, but only conditions common to them and to other causes. Sulphurous acid gas, for example, produces inflammation of the air passages, but this inflammation has no special characters which would indicate its origin.

Hirt classes gases and vapours together as being the same, medically speaking, though different physically; in each case (as in the dust inhalations) a number of foreign particles are breathed into the lungs which may injure the organs of respiration; these effects, in the case of dust inhalation, are catarrh and consequent emphysema, inflammation of the lungs and inflammatory phthisis (die eutzündliche Lungenschwindsucht). Some gases may also pro-

* Die Krankheiten der Arbeiter." Erste Abtheilung. Zweiter Theil. 1873.

duce these effects, but other sequences also. The earlier chapters deal with the gases in their simpler form; the effects of carbonic oxide; carbonic acid; a mixture of the two, with a little sulphuretted hydrogen, as in coal and charcoal fumes; coal gas and sulphide of carbon need not be noticed except as regards one or two points. In speaking of carbonic oxide, Hirt notices the different effects produced by it when the temperature is high (25—32 cent.) or low (8—12 cent.). In the former case the convulsions are well marked; in the latter case usually absent. Individual conditions also influence its action; pregnancy, for example, greatly heightens its effects. In respect of coal fumes and of coal gas, Hirt remarks, that it is of importance to know that cases of chronic poisoning are not uncommon.

Carbonic Acid.—The effects of carbonic acid are given under several headings. The poisonous influence of large quantities of the pure gas is described as usual, but Hirt lays great stress on the modifying influence of constitution; some persons are much more affected than others; and while in most cases heaviness in the head, vertigo, noises in the ears, and sparks before the eyes come on, in other cases there is no head affection, but in its place very uneasy respiration, often combined with pain in the chest. Convulsions are also variable in their intensity and presence. In all cases, however, sooner or later, loss of consciousness, and of power of movement comes on. With regard to chronic carbonic acid poisoning, that is, to the effect of the constant inhalation of small quantities insufficient to produce the toxic effects of the larger doses, Hirt concludes that there is not the least evidence in favour of any such chronic intoxication. He does not refer to any cardiac symptoms, nor does he seem to be aware of A. Smith's experiments. The effect of carbonic acid when mixed with other gases or with vapours, as in some trades, is another matter. Hirt remarks, in the first place, that it is a known matter of fact that, independent of any special trade, health suffers when a great number of workmen are employed in a small space. The effects appear to be attributed by him to increase of carbonic acid from its normal ·4 volumes per 1,000 to from 7·8 and 12 per 1,000. Apart from these cases the trades in which carbonic acid is evolved are those in which organic substances are fermented, or in which carbonic acid is evolved from mineral matters. In the first category are beer brewing, wine making, distilling, and yeast making, in all of which trades considerable quantities of carbonic acid are evolved. In none of these trades has Hirt been able to trace injurious effects, except the acute poisoning. He describes fully the effects of the carbonic acid evolved in the compressed-yeast manufactory at Neisse in Silesia, where an immense amount of carbonic acid is given off; the precise quantity has not been determined, but at the ground level it is supposed that it reaches 10 per cent. In this manufactory acute carbonic acid poisoning sometimes occurs, but no chronic effects, or any influence otherwise on health, is perceptible. In part this may be attributable to the excellence of the ventilation. Nor in the various processes of wine or beer making are injurious effects produced by the carbonic acid, though some other parts of the process (the cellar work especially, where, however, the atmospheric oxygen is lessened) may be hurtful.

Hirt's experience is therefore negative, but it must be observed that, as he several times notices, the ventilation of all these manufactories is good, and it therefore is really not clear from his work what is the precise percentage of carbonic acid which the men breathe. All his evidence shows, however, that with good arrangements there is no danger in the industrial processes which give rise to disengagement of carbonic acid.

Mixture of Carbonic Acid and other Gases.—In certain cases carbonic acid is mixed with other gases; this is particularly the gas in churchyard and cemetery vaults, where the gases disengaged are carbonic acid, often in very great quantity, ammonia and sulphide of ammonium; the less advanced the process of decomposition of the body, the larger relatively is the amount of H_2S. That there are also other matters in the air of burial vaults is not doubtful, but what these are is not known. The poisonous effects produced by this atmosphere are those of carbonic acid. When gravediggers are not exposed to the dangers of an acute intoxication with carbonic acid, their calling is not, according to Hirt, in any way hurtful; the yearly annual

mortality is only 17 per 1,000, and the mean duration of life is at least 58—60 years. (!)*

Well-sinkers are, as is well known, also exposed to the dangers of acute carbonic acid poisoning; but in this case also, Hirt denies that there is any chronic poisoning from constant inhalation of small quantities of the gas.

Sulphuretted Hydrogen.—Hirt describes the acute H_2S poisoning in the same way as previous writers. With regard to the vexed question of the liability of men who work amidst large quantities of H_2S gas to suffer from chronic poisoning, he appears to have no doubt of its occurrence. "The "symptoms of chronic H_2S poisoning," he says, "consist chiefly in general "weakness, depression, and generally perfect anorexia, which is combined "with the feeling of a weight on the stomach; the tongue is furred; the "mucous membrane of the mouth and face is pale; the breath is not always "offensive; the pulse has a tendency to be slow. In some few cases there is "a furunculoid skin eruption on several parts of the body which forms "nodules which suppurate."

Sometimes, however, he says the symptoms show more particularly poisonous action on the intestines; there is vertigo, headache, nausea, and diarrhœa, followed by gradual emaciation and then by head symptoms, so that the case "resembles one of very slow running typhus."

Hirt notices, however, that there are great individual differences; some men are very little or not at all affected, others greatly so, and in some the susceptibility increases with custom.

Bisulphide of Carbon.—This substance, obtained by passing sulphur fumes over burning coal and subsequent distillation, is now much used in commerce in consequence of its solvent effects on india-rubber and some other resins. On animals its vapour exerts poisonous effects, first exciting and then soon paralysing the nerves of respiration and circulation. In men its acute effects are seldom seen, on account of the small quantity inhaled, but it produces chronic poisoning in some workmen. The symptoms of this are described by Hirt, after Delpech, as mainly embraced in two periods of excitement and collapse; the first period begins with evening headache, pains in the limbs and formication; sometimes there is intellectual excitement and exaltation; there are often cramps, difficulty of breathing, and increased frequency of the heart. The sulphide can be smelt in the urine. After some weeks or months the second period follows—depression; heaviness; anæsthesia of some parts of the skin; diminution of sight; and, in some cases, of hearing. Sexual desire, excited in the first period, is lost in this. The workmen generally leave the factory when these symptoms are marked, and appear to recover entirely or partially.

The Gases of Putrefying Substances.—The bad-smelling gases and effluvia given off from animal substances, which are being macerated in order to prepare them for some trades' purposes, are those referred to by Hirt under the above heading. He does not profess to be able to state exactly the chemical nature of these effluvia; he says that "they consist of CH, NH_3, N, and "sometimes also of H_2S," while the offensive smell is caused by the presence of trimethylamin; amylic, butyric, propionic, and formic acids.

The trades exposed to such emanations are tanners, catgut and gelatine makers, butchers, soap boilers, candle makers, fullers and cheese makers. In some of these trades, particularly in catgut and gelatine making, the odours are extraordinarily offensive, and indeed insupportable to persons who are unaccustomed to them. Yet Hirt declares that no injurious results follow.

What he says about the gelatine makers may be quoted as an illustration. After remarking that the smell in the places where the manufacture goes on is truly insupportable by those who are unaccustomed to it, and that quantities of gases are developed (especially when lime is not sufficiently used) whose effect on the organ of smell defies description, and must be experienced in order to be known and feared; he goes on to say, "It is quite unproved that

* Throughout the whole work the statistics are so briefly given, that it is not possible to know what weight should be attached to them.

"these evil-smelling gases and vapours in the gelatine manufacture are in any "way injurious; on the contrary, when we study the state of health of these "workmen, we are forced to the opinion that these vapours possess the pro- "perty to strengthen the bodies of those who continually breathe them, and "in this way contribute to the improvement of the health of the labourers. "Enquiries in a tolerably large number of Silesian gelatine factories and white- "leather tanneries (where also much gelatine is often made), and observations "on many artisans concerned with gelatine boiling, have convinced me of the "correctness of this opinion. No single case has come before me where any "affection either of the lungs or of the digestive organs has been proved to "have any connection with these vapours. We are, therefore, not in a "position to recognize any unhealthy action in the odours of the gelatine "manufacture." (p. 152.)

The effect of repulsive odours of this kind is then, it is supposed, limited to the sense of smell, which soon acquires an extraordinary degree of tolerance. What is the exact composition of these odours? They are, no doubt, of organic nature, and not stable like a gas. Consequently they are probably destroyed soon after their absorption into the blood, or they may not be absorbed at all but remain outside the body. That they render the workman actually healthier, as Hirt implies, seems unlikely, and possibly the high wages given in these repulsive trades and the better food thus obtained, may have most to do with the high standard of health.

Zinc Vapours.—In reference to the "brassfounders' ague" of Greenhow (the brass ague of Thakrah) Hirt describes the effects produced on himself when he was enquiring into the subject.

The first symptoms (coming on a few hours after the inhalation of the metallic vapours) are peculiar, uncomfortable feelings in the body—weakness, pains in the back, and then often very severe muscular pains; the pulse and respiration are at this time tranquil. Then comes on a general shivering, lasting 15 to 20 minutes; the pulse quickens, reaching 100 to 120, and cough ensues so severe as to cause pain in the chest and to make the frontal head- ache almost unbearable; the height of the attack is reached in from three to six hours, and then a copious sweat breaks out; the pains lessen and the patient falls into a deep sleep, from which he wakens with merely a little weakness and some remains of headache.

This curious affection which might very well be mistaken for ague, is not lessened by habit; nothing protects the men from it; they fancy, however, that previously drinking large quantities of milk lessens the severity of the attacks.

With regard to its production by metallic fumes, no doubt is felt by Hirt. He does not, however, seem convinced that copper fumes may not play some part, and he also states that the workmen engaged in making zinc houses, who inhale pure zinc vapour without copper fumes (which exist in the fumes of smelters) never suffer from this brassfounders' ague.

Vapours of Iodine, Bromine; and Vapours from Oil, Tar, Petroleum, Benzoin, &c.—Hirt states that poisonous symptoms from iodine and bromine vapours very seldom occur, but when they do happen they are acute, very variable in kind (cough, headache, sometimes partial loss of consciousness, irritation of the eyes and nose, and iodine catarrh) and are never or very rarely fatal.

Vapours from vegetable oils (such as rape, linseed) are not injurious. Hirt denies altogether the old statement of Ramazzini (that headache, giddi- ness, and cachexia are produced) and states that he could find no bad effects; indeed, he thought the workers in oil less liable to catarrh, and men with tendencies to chest disease appeared to get stronger. He could not, however, feel certain that phthisis was actually cured by the oil-vapour.

In other vegetable oil factories, injurious effects may arise from the dust produced by the pulverising of the vegetable structures and by the effluvia from the volatile oils. But, with the exception of mustard dust, which some- times causes violent bronchial catarrh, the bad effects are inconsiderable.

With regard to vapours of turpentine (about the injurious effects of which on men there has been much discussion), Hirt relates some experi- ments on 21 men who inhaled considerable quantities of turpentine. He

concludes, that with persons unaccustomed to its use, short periods of inhalation, during which much turpentine is introduced, produce injurious symptoms; respiration was slower; cardiac action quickened; and at a later date the brain and cord were affected and there was heaviness, headache, nausea, noises in the ears, &c. Workmen, however, generally get accustomed to the fumes; workmen in shellac, asphalt, and india-rubber do not suffer, except in very rare instances, when india-rubber workpeople may be injured by the inhalation of fumes of bisulphide of carbon.

The effects of the vapours evolved in the making of various tar products and in other trades, have been also carefully studied by Hirt, but the work must be referred to for this evidence.

III.—Soil.

The relation of changes in the Ground-water to Mortality.

In the Report on the Sewerage of Berlin, by Professor Virchow, referred to in the section on sewerage, is an extremely interesting chapter on the ground-water at Berlin, and on its relation to disease. The mortality in Berlin is great, and presents one curious point in which it differs from almost all other European experience, although it finds a parallel with the mortality of New York and Chicago. This peculiarity is that the highest mortality in Berlin is in July and August, as will be seen from the following table:—

	In 100 deaths there occur
In January	7·3
„ February	6·7
„ March	7·5
„ April	7·1
„ May	7·4
„ June	9·3
„ July	12·9
„ August	10·9
„ October	7·9
„ November	6·9
„ December	7·6

Now this course corresponds accurately with the changes of the ground-water, in this way: the rising of the ground-water which occurs in the winter is coincident with the fall in the death rate, and the sinking of the ground-water which occurs in the summer is coincident with the rise in the death rate. "If," says Virchow, "we express these three circumstances in curves, a rise in the "curve of the mortality always corresponds with a fall in the curve of the "ground-water and of the Spree and *vice versâ*. Nothing appears, therefore, "more decided than that the water-level influences the mortality, or we may "say, diseases. "Nevertheless a fourth factor enters here in reality, viz., the "temperature. With us, as a rule, the temperature rises, while the water in "the soil and in the open streams falls, and reversely. It can also not be "doubted that the fall in the water-level is conditioned by the increased "evaporation produced by the increasing temperature, that there is in fact an "intimate connection between the temperature and the water-level. Nothing "is opposed to the view which considers the increase of diseases as the result "of the combined injurious agencies which the increase of temperature and "the fall of the water bring about." (p. 55.)

On analysing the data farther, however, Virchow discovered a remarkable fact; the great increase of mortality in July and August (which makes Berlin an exception to most great European cities) is not owing to an increase in the deaths of adults, but to the deaths of children under one year of age. In December, January, and March, 1870, there died 1,531 children under one year; in June, July, and August, there died 3,789; in 1871 the numbers were 1,878, in December, January, and February, and 4,220 in July, August, and Sep-ember. It is, therefore, the enormous mortality among young

children which produces the exceptional result, for persons over 15 years die more in the cold months than in summer; this discussion leads Virchow to the following conclusions :—

"1. The total mortality of Berlin is, in its seasonal course, entirely governed "by the enormous mortality of children under one year."

"2. The mortality of adults is principally dependent on the temperature," (is highest in the cold months). "It is only influenced in a slight degree by the level of the ground and river-water."

"3. The mortality of children under one year is in part dependent on the temperature; it agrees, however, in its frightful summer increase with the period of falling ground and river-water."

Virchow then enquires more particularly into the mortality of children. In the 3 years 1867–70 there were born in Berlin 90,672 children, and of these 26,550 died under one year old, or 29·28 per cent. From an examination of the figures it is proved that the summer mortality is not owing to the greater number of births then taking place (there are more in the winter); nor is it owing to any conditions of sex, or to illegitimate births. "It can," says Virchow, "be only to conditions of air, or of water or of food, to which it "can be referred, and in each of these cases there are removable conditions "which are the problem of State hygiene."

Typhoid Fever.

With regard to typhoid fever and ground-water, Virchow has some interesting remarks. He refers to the importation of contagious spotted typhus and of relapsing fever which he terms "traffic-diseases;" but typhoid fever is a standing disease at Berlin, and at all times there are some cases. The most striking evidence has been obtained of its dependence on the changing level of the ground-water. "The cases increase when the ground-water "sinks, and they lessen when the ground-water rises. At the time of the "lowest water-level we have every year a little epidemic." (p. 63.) It appears, however, that the increase is not so great as these words imply; the mean of 7 years gives the following deaths: January, 669; February, 593; March, 504; April, 589; May, 582; June, 561; July, 739; August, 956; September, 1,138; October, 1,149; November, 974; December, 793. Although this shows a relation to the ground-water (which is lowest in the summer and autumn) when typhoid is most prevalent, other causes must be acting throughout the year, and it seems to me certain that the changes in the ground-water constitute only one of the factors (and not the most important) in the mortality from typhoid at Berlin. At Zurich, in 1872, the results of the ground-water measurements were directly opposed to Pettenkofer's view; the typhoid epidemic occurred during the rising of the water, and when it had reached its highest point.

IV. Sewerage.

The *air*, or so-called *pneumatic* plan of removing sewage proposed by Captain Liernur, has had many ups and downs in public opinion. It appears, however, to be gaining advocates; at the Vienna Exhibition a block of houses sewered on this plan was shown, and the result was said to be highly successful; and from a pamphlet published by the Vienna Joint Stock Agricultural Society* I learn that this Society has purchased the patent for Austria and Hungary, of Liernur's system, in the belief that not only will it be successful in a hygienic point of view, but will be profitable. In reference to the first point, a Report has been made by Dr. von Hamm,† the Vice-President of the International Medical Congress, which met in Vienna, in September, 1873, and minutely examined the houses in the Exhibition thus sewered. It is observed in this Report that a sytem of deodorization is now combined

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* "Œsterreichische Actien-Gesellschaft für Bodencultur. Liernur's Städte-Canalisations-System." Wien. 1873.

† See a pamphlet published by Scott (Old Broad Street), entitled "Liernur's Pneumatic Sewerage." 1873, p. 18.

with this plan; an india-rubber ball is pressed at the moment the person rises and squirts a deodorizing liquid on the fæcal matter; when the next person sits down the ball fills itself again with the liquid, and when the person rises is again discharged. The Report states that the trials made in the presence of many members of the Congress "convinced them that the "entire system is capable of doing its task completely."

With respect to the return from the application to the earth we have at present mere estimates, and experience has shown how very little all past calculations of manurial value can be trusted. The Viennese Agricultural Society calculate (p. 15) that the profit will be very large, and that the whole cost of the apparatus will be more than paid for the first year, but actual experience can alone truly decide this point.

In Holland the plan seems to be gaining favour, and Ballot states it is to be further developed in Amsterdam.

Although this system has to this time been only applied to comparatively small areas, and although the cost of construction and the amount of return are still matters of doubt, it would seem very desirable to have its working thoroughly investigated by our Government. A question of this kind is really a national one, and the position in which so many of our towns are placed is so critical, that this method of dealing with the problem of sewerage ought to receive attention and have its merits determined.

The "dry earth system" has been extremely well discussed by Dr. Voelcker in a Report* which ought to have been noticed last year. Dr. Voelcker bears full testimony to the deodorizing efficiency of the dry earth system, and to its great hygienic usefulnes in small constituencies, but he entirely confirms Gilbert's analyses that the earth-poudrette is of little agricultural value. This has been expected, but it is not the less a conclusion much to be regretted, as it destroys the chance of this system being profitable and perhaps even of its paying its own expenses. Dr. Voelcker gives several analyses which all tell the same tale. I extract one which will give a good idea of the whole.

Composition of Earth and of three samples of Earth-closet manure produced at West Riding Prison, Wakefield, in dry state (dried at 212° Fah.).

	No. 1. Earth for use in closets.	No. 2. Earth once used in closets.	No. 3. Earth twice used in closets.	No. 4. Earth thrice used in closets.
*Organic matter and water of combination	9·88	9·79	11·53	12·22
Oxide of iron and alumina.. ..	12·95	16·15	14·11	12·48
Phosphoric acid	·18	·25	·44	·51
Carbonate of lime	2·21	2·25	2·13	2·14
Magnesia	1·44	2·63	·77	·90
Alkalies and loss in analysis ..	1·35		·72	·74
Insoluble siliceous matter (clay and sand)..	71·99	68·93	70·30	71·01
	100·00	100·00	100·00	100·00
*Containing nitrogen	·31	·37	·42	·51
Equal to ammonia	·37	·45	·51	·62

* "On the Composition and Agricultural Value of Earth-closet Manure." "Journal of the Royal Agricultural Society," No. 15, p. 185 (1872)

Although in such analyses it is impossible to get earth always of the same composition, and equally well mixed with the fæces, these results show how comparatively little ammonia the mixture gained even after 3 times use; either the ammonia volatises by the heat used in drying the soil, or, what is more probable, it really receives little from the solid excreta, and the small portion of urine which passes into the earth.

Gilbert's Analyses,* are quite in accord; they are as follows:—

	Before use.	After using once.	After using twice.
Percentage of moisture in air-dried and sifted soil (loss at 212° Fah.)	8·440	9·970	7·710
Percentage of nitrogen in air-dried and sifted soil	·067	·216	·353
Percentage of nitrogen in soil dried at 212° Fah.	·073	·240	·383

It may be concluded, as Gilbert says, that the earth-closet manure is not richer in nitrogen than good garden mould even after using twice, and that "even if disposed of free of charge, it would bear carriage to a very short "distance only."

Dr. Voelcker asks, how is it that market-gardeners and others, who have made trials with this description of manure, put a value on it varying from 1*l.* to 3*l.* a ton? He replies, that this high estimate rests on no solid foundation, and intimates in fact that such prices will not be maintained. He challenges indeed the usual estimate of the value of the excreted matter, and states, that though it has been asserted that in Belgium the annual value of the excreta is about 1*l.* for each person, he found by inquiries that the town population seldom realizes as much as 1 franc (9½*d.*) per head per annum. He himself calculates the value of all the urine and fæces of one person, as equal to 9*s.* per annum, which is close upon Mr. Lawes' estimate of 8*s.* 10*d.* He also calculates that the value of a ton of earth-closet manure will after using 5 times, be only 7*s.* 6*d.*

These results are very unfavourable to the prospect of using the earth-closet in large communities, as the expense of bringing, and drying, and distributing, and then carrying away the earth cannot be compensated by any adequate return. These numbers are in fact well worthy the consideration of any community, large or small, which contemplates the establishment of an earth system.

The aspect of the "water system" of removing the excreta has not changed much in the year. The small value of the deposits obtained by precipitation has been still more clearly seen, and the purifying effects of filtration through earth have been again shown by analyses conducted by the Committee of the British Association. An extremely able Report, by Professor Virchow,† gives a summary of the experiments in Berlin, which have been carried on for years in order to determine the best mode of dealing with the excreta of a large city placed in a plain, and with only a sluggish river to receive the excreta. After full consideration a system of water sewage is to be carried out, and the sewer water will be purified by land filtration, or in the winter by disinfection and precipitation, before discharge into the Spree. The thorough and impartial discussion the whole subject receives from Virchow is quite remarkable, and the Report ought to be well known to all concerned in such works.

* Quoted by Voelcker, p. 195.

† "Reinigung und Entwasserung Berlins," General-Bericht von R. Virchow. Berlin. 1873.

Mr. Baldwin Latham* has published a work, which will be very useful to Officers of Health. Of course much of it is technical, but a good deal applies to the daily work of Medical Officers. I extract a few points of interest. With respect to "self-cleansing sewers," and after remarking that pipe sewers are not necessarily always self-cleansing, but may become "sewers of deposit," and brick sewers on the contrary may be self-cleansing, Mr. Latham states, that the velocity of flow in a sewer should never be less than 2 feet per second, and in the generality of cases should be greater, and he gives tables by which the velocities in circular and egg-shaped sewers can be easily calculated.

In speaking of the course of sewers he gives a diagram of the plan he is carrying out at Dantzic; he has constructed the branch sewers as far as possible in straight lines with man-holes at all lateral deviations; whenever more than one sewer enters a man-hole he has put the outfall sewer (that is the continuation of the sewer) at a lower level than its tributaries; the effect of this is to facilitate the ventilation of the sewers, but especially to assist in the discharge, for without it the effect of two sewers entering at one point may be that the current of one is dammed. By thus allowing the sewers to join in man-holes, if one line of sewer is blocked another may be used for the discharge.

Mr. Latham discusses the question whether sewers should pass at the front or back of houses, and considers it is a matter chiefly of convenience of getting at the sewers. He considers that "with perfectly constructed and "well ventilated houses, the evils of carrying them through or under houses "are more imaginary than real;" but on this point I hope no Officer of Health will agree with him. With regard to shape of pipe he advises circular shape up to 18 inches diameter, and above that oval or egg shapes. He tests the degree of permeability of an earthenware pipe by drying the pipe till it ceases to lose weight, then soaking it for 24 hours, wiping it dry, and weighing it again; also by closing one end of a pipe, pouring water into it, and noticing whether the water oozes through; the tenacity of earthenware pipes varies from 21·4 lbs. to 429·5 lbs per square inch of surface, so that there is great uncertainty and variableness in strength. He gives us a caution to see that the socket has been made with and is a component part of the pipe, and not simply joined on as is done by some manufacturers, and he also advises that a recess should always be cut in the trench to receive the socket, otherwise the pipe between the sockets does not rest on the earth but is supported only by the sockets; he says, many early failures in laying sewers were due to this simple error alone; he thinks clay well worked is sufficient for jointing, except in wet subsoil, where Portland and sand must be used; but when cement is used it must be seen that it does not run into and clog the pipe as sometimes happens. The best mode of joining pipes is to force into the socket several strands of tarred gaskin, so as to fill the socket tightly, and then to work in clay or cement, as usual. This preserves the "annularity" of the joint, and no crevice for the admission of water or sand is formed by the slight displacement of the pipe in the socket.

If pipes are laid properly, and in straight lines, and with man-holes at changes of inclination or direction, he thinks there is no necessity for "access" pipes. He speaks well of good concrete pipes, which are now much used in Germany; pipes of 15 and 18 inches diameter have a thickness of 2 inches; the best Portland cement must be used. Concrete (3 bushels of cement to 1 cubic yard of sand and shingle) can also be used for the larger sewers. When pipes are carried among roots of trees, the pipes should be iron and jointed with lead as rootlets work their way through.

Larger sewers are made of brick, or of concrete, or both, and Mr. Latham speaks well of a single ring of brickwood embedded in concrete. After discussing fully various points connected with the strength and laying of these sewers, and of water-pipes, and with junctions, Mr. Latham passes on to consider two points of great importance, viz., the flushing and ventilation of sewers. He does not think it necessary to provide in flushing for a volume of water equal to the full discharging capacity of the sewer; for, paradoxical

* "Sanitary Engineering; a Guide to the Construction of Works of Sewerage and House Drainage." By Baldwin Latham, C.E. 1873.

as it may seem, "there is a point in the flow of all sewers when they discharge "more than when running full." A good flushing power may be, therefore, considerably less than the full discharge of the sewers, and the exact amount for sewers of different sizes and inclinations can be seen from his tables. He describes and figures the different flushing gates (half, three-quarters, and whole gates), and the means of opening them. He describes a simple self-acting gate where the gate is hinged below its centre; the pressure of the sewage on the lower part fixes the gate in the path of the sewage, and when the sewer-water rises above the hinge and presses on the upper part, which of course is heavier than the lower, the gate tilts, falls on catches and remains horizontally in the sewer. He describes also some self-acting tumblers placed at the head of sewers. With regard to flushing, he considers the admission of rain-water very desirable, but he does not allude to the large introduction of street grit often carried in by rain.

His chapter on Ventilation is very valuable, and he commences it by the following extract from the "Digest of Justinian" (completed in the year 555): "The Prætor took care that all sewers should be cleansed and repaired for "the health of the citizens, because uncleaned or unrepaired sewers threaten "a pestilential atmosphere, and are dangerous." He states that the Romans constructed man-holes 120 feet apart, to admit not only workmen but light and air; and that they also ventilated every descending drain of a building, and that the head of all the drains of a building ended in an outer corridor open to the air.

With regard to the system of ventilating, after some calculations as to theoretical movement he discusses the plan of ventilating sewers by furnaces, and shows chiefly from Mr. Bazalgette's observations how impracticable a plan this is. He then alludes to the idea of closing the sewers entirely, and maintaining such a current as to convey away all matters before decomposition sets in, and he cites Croydon as a proof of the failure of this plan. The deodorization of the sewage or the absorption of the gases are also shown to be impracticable. The use of shafts, street lamps, rain-water pipes, of the Archimedian screw, of fans worked by the sewage itself, are next discussed.

He considers that the ventilation of sewers by means of shafts communicating with the crown of the sewer and terminating about the centre of the roadway as carried out in London, is the best that can be adopted, provided the shafts are sufficient in number, and are provided with materials for absorbing the gases. Of the various plans proposed from time to time (such as evolution of chlorine and sulphurous acid in the shafts), he gives the preference, as will have been anticipated, to trays of charcoal; and he figures various arrangements including the plan of spiral trays devised by himself. In the case of house drains, he prefers the Roman plan of carrying up ventilating pipes at the heads of the drain and its branches, taking care of course that the point of exit should not be near a window, or ventilator, or top of a chimney.

The latter part of the volume is occupied with a description of gullies and traps, of tank sewers and of watercloset; many illustrations are introduced, and it may be truly said that no more practical or useful book has been published of late years on this subject.

V. The Specific Diseases.

Typhus in North-West India.

In the Report for 1872, I alluded to observations made by Dr. Fairweather, which proved that true exanthematic typhus was known in the Punjab.

Surgeon-Major Ince has lately published an exhaustive Report on an epidemic of true typhus in the gaol at Ráwalpindi.* Knowing that fever had often occurred epidemically in this gaol, he was determined to settle the question of diagnosis in the next outbreak, and to undertake an investigation by the aid of a scheme used by Dr. Wilks, of Guy's Hospital, for determining the nature of disputed fevers. About the 2nd January fever began to prevail, and lasted

* "Report to the Commissioner on the recent Epidemic of Fever in the Ráwalpindi Gaol." By Surgeon Major John Ince, M.D. Republished in the "Indian Med. Gaz.," Sept. 1, 1873.

until the beginning of May. Out of 982 prisoners, there were 424 admissions (43·2 per cent.) and 40 deaths (4·16 per cent. of deaths to population, and 9·43 per cent. of deaths to cases treated). This terrible outbreak was made up entirely of true typhus; the symptoms are minutely detailed by Dr. Ince, and agree completely with the English typhus exanthematicus in the usually sudden and severe onset, the early high temperature,* the great prostration, the eruption (sometimes copious) of dusky-red persistent patches in several cases (21), the supervention of the low sinking so-called "typhoid state," and the termination of the disease about the 15th day, though sometimes it ended on the 8th, or was prolonged to the 19th day. There was no diarrhœa or lesion of Peyer's patches on post-mortem examination (in 22 cases). Of the hospital attendants, 12 out of 16 contracted the disease, and out of six medical attendants, two were attacked (two of the six appeared to be protected by previous attacks). The disease did not spread to the gaol-guard, nor was it communicated outside, although there was a good deal of communication. Dr. Ince concludes, however, that the disease was decidedly contagious. The question of the origin of this fever, which was undoubtedly contagious spotted typhus, is of extreme importance. Two hypotheses presented themselves: either the disease was introduced from without, or it arose in the gaol either by generation *de novo*, or by revivification of dormant germs. As to the first point, a batch of 99 prisoners arrived on the 2nd January from Peshawur Gaol, which they had left on the 23rd December, and where typhus prevailed. One had died on the road, but the cause was unknown; on admission none had fever, and the first case which occurred among them was on the 12th day after leaving Peshawur. At this time also it would seem that cases had already occurred among the other prisoners. Dr. Ince could not therefore ascribe the introduction to these Peshawur men, and in his Report is disposed to leave the matter in doubt; but it appears from subsequent communications, especially letters from Mr. Thornton (the Secretary to Government in the Punjab), that typhus fever was actually prevailing at the time in the town of Ráwalpindi itself. The cases, including temperature, observation, and post-mortem examination, are detailed by Dr. Ince; they were made with great care by him and by Dr. Lombard, a young Assistant-Surgeon of great ability, who unhappily took the disease and died of it.

The important part of true typhus existing, therefore, not only in two of the gaols in the Punjab, but also in the population at large, is quite satisfactorily established; and it is difficult to overrate the value of this observation.

In the Indian "Medical Gazette" for July 1st, 1873 (p. 181), there is also recorded a typical case of typhus fever in a native hospital assistant who caught the disease while attending the gaol prisoners at Ráwalpindi. The symptoms are carefully given, and prove the case, which ran a course of about 18 days from access to defervescence. Even in the Burdwan fever it has been supposed, from a thermometrical chart, that some of the cases are really typhus, but this is doubtful.

Enteric (Typhoid) Fever.—Enteric fever is the most common of the specific diseases in Europe and America, and probably in India. Yet opinions as to its origin and method of spread are not yet settled, and though there is a certain basis of agreement among the majority of physicians, yet the differences remain very considerable. This has been remarkably illustrated by two works published in England by Dr. Murchison† and Dr. William Budd,‡ and in Germany by the report of the debate§ in the Medical Society at Munich on typhoid fever.

As the subject is not only of great importance, but also resembles very

* Most excellent thermometrical and clinical histories were made by Dr. Lombard, whose enquiries materially elucidated the subject, but who unhappily fell a victim to the fever.

† "A Treatise on the Continued Fevers of Great Britain." By C. Murchison, M.D., F.R.S. Second edition. 1873.

‡ "Typhoid Fever." By William Budd, M.D., F.R.S. 1873.

§ "Ueber die Actiologie des Typhus" (Vortrage gehalten in den Sitzungen des ärztlichen Vereins zu München, 1872).

curiously the condition in which the hypothesis of the propagation of cholera now is, it may be interesting to give a short sketch of the present evidence, as shown especially in the two works above quoted.

Dr. William Budd is well known as the strong advocate of the view which looks on cases of typhoid fever as caused by continuous development either in or out of the body, so that one case more or less directly derives the disease from a previous one. Dr. Murchison is the principal advocate of the view which considers that cases may arise independently of any prior case, and are caused by "air or drinking water polluted with the products of "putrefying sewage" (p. 482). While advocating this view, Dr. Murchison expressly admits (p. 465) "that enteric fever is in some way communicable by "the sick to persons in health," and he thus admits two modes of communication—one, the rarer, in which healthy persons catch typhoid fever in some way from persons ill with that disease; and secondly, a more common mode, in which persons get the disease because they breathe or swallow particles of putrefying sewage, not derived from persons ill with typhoid fever. To use the common, though inaccurate phrase, these cases arise spontaneously.

In enforcing his view, Dr. Budd describes with most graphic force, from his own experience, the spread of typhoid fever in villages where the previous non-existense of the disease, its introduction at a given date by a person arriving who had the disease, and its subsequent spread, were all perfectly proved. Nothing can be stronger than his facts, but it would have added to his argument had he given short references to the other very numerous cases of this kind, beginning with those collected by Bretonneau more than fifty years ago. These cases are very numerous both in France, Germany, and England; and, even since Dr. Budd wrote, another instance has been given by Dr. Ballard, the main facts of which may be cited :*—

A row of three cottages, made out of an old farm-house, and under one roof, was inhabited by three families, midway in the little street of the village of Combroke, near Stratford-on-Avon. In these three cottages an outbreak of typhoid fever occurred in February, 1873, while all other houses in the village on either side entirely escaped. What was the reason of this attack and of this escape? "For many years prior to this outbreak there had been "no case of enteric fever in the village," says Dr. Ballard. There must, therefore, have been something very special to cause such a localized outbreak in these three cottages. On November 14 a girl, aged 17, from one of these cottages, went to service in Leamington, to a house where a young lady had just recovered from typhoid fever. On November 25th the girl began to have diarrhœa, and on December 3rd had shivering, and went to bed. On December 8th she was removed to her own home at Combroke, with the diagnosis of typhoid fever (confirmed by four medical men), and became convalescent in about three weeks after her return home. All her evacuations were thrown into an ash-pit privy common to two of the cottages; her soiled linen was washed by her mother, and the water was emptied into a grating in the yard. The family in this cottage consisted (in addition to this girl) of nine persons, of whom four were at home at the time; three came home in March, and two others were occasionally at home. There was also a nurse in the house in March who was not attacked. Now of these nine persons, no less than seven were attacked with typhoid fever in February and March, and the two who were not attacked were those who were there for a short time. In the next cottage, which used the same privy, there was a family of nine, of whom three got fever. In the third cottage (where there was a separate privy) there were two cases, and both were mild. Dr. Ballard enters minutely into the question of whether the air or the water was the medium of communication, but this point is foreign to my purpose. No other cases occurred in the village. Now can any one shut his eyes to the force, positive and negative, of this evidence? Is there any link wanting, or any shade of doubt resting on any part of this history? Then multiply

* "On Enteric Fever in the Village of Combroke (in February, 1873)." Report to the Medical Officer of the Local Government Board. Not yet published.

this instance by scores of similar cases, and we form an idea of the position taken up by those who adopt, like Dr. Budd, the view of continuous succession.

It must be candidly stated, also, that Dr. Murchison has not presented this side of the argument with sufficient detail. He cites (p. 464) only six cases of typhoid fever introduced into a locality previously free and then spreading; and he admits, as already said, from those six cases the occasional communicability of the disease. But, on such a point, it would have been surely better to have cited more of the published evidence of communicability; by not doing so, it looks as if the instances were very few and very rare, which is really not the case.

This positive evidence is Budd's first position. His second is a negative argument. If putrefying sewage produces the disease, how is it, he asks, "when the pythogenic compounds are rife," there is often no fever born of this putrescence; sewage emanations are inhaled for years in some places, and give rise to no typhoid fever; he develops this at some length, and with his usual cogency and felicity of style.

His third argument is of another kind; it is, that he has always arrested the disease from spreading in houses, schools, communities, by thorough disinfection of the typhoid discharges. This argument, as based on a smaller number of facts, is of course less cogent than the others.

I will now turn to Dr. Murchison's method of dealing with the evidence. The points which seem to have chiefly impressed him appear to me to be two :— 1st. The great number of cases which seem to occur altogether independently of other cases. While the entrance of some putrefying substance is nearly always easy to be proved, a descent from a previous patient seems impossible, for, in many cases, not a particle of evidence can be found to favour this idea of derivation from another case. 2nd. The other point is the number of cases in which persons ill with the disease do not communicate it to others; from whom, in fact, there is no further spread.

Dr. Budd does not seem to me to have dealt with these two great difficulties with sufficient care. He is so impressed with the ease of tracing the communication in small country villages, and the difficulty of tracing it in towns, that the weight of such negative evidence seems to him immaterial. In addition, his mind is of that order which refuses to credit two different origins for the same specific agent, and the undeniable facts of contagion completely override what seems to him the much looser evidence of independent origin. That the evidence is loose in many cases must be admitted. Murchison gives 17 cases in which the fever apparently originated from bad drainage, while the introduction of an agent from without seemed excluded, and of course these are intended to be indisputable cases. But most certainly in some of these the evidence ought not to be accepted. Take the case of Ratho in Scotland (the tenth instance adduced by Murchison, p. 476). Here a well was contaminated with sewage, and several persons suffered. An account was published by Dr. Sheriff, who could trace no importation. A groom had come to the house ill, and Dr. Sheriff diagnosed his case as one of bronchitis, and has now also imformed Dr. Murchison (see foot note, p. 477) that several of the cases of fever had commenced before. Now this outbreak was investigated by a physician whose knowledge and fairness I can with perfect justice assert, and who was a relation of the owner of the house, and he informed me that he had no doubt a mistake in diagnosis had been made; that the very first case was a groom who entered the house with diarrhœa, and who had unequivocal typhoid, that all the other cases were subsequent, and that the drinking water must have been contaminated by sewage soakage for a long time (probably years before), and yet had never up to that time produced typhoid fever. Now here is a conflict of evidence; it may perhaps be impossible to decide who is right; but surely the case of Ratho has no claim to be brought forward as a piece of undoubted evidence against the introduction from without. It ought to be struck out of the brief. Again, Gordon Hardie's two cases in the prison at Limerick (Murchison, p. 477) are very remarkable, but they do not quite bear out Murchison's inference. It is true that there was a choked surface drain, but Dr. Hardie gives evidence that the reference of one case to this cause was impossible, and although the other

case may have been caused by the drain, the proof seems to me very uncertain At any rate, there is too much doubt to allow the evidence to be used.*

From Dr. Murchison's list of 17 cases of independent origin from fæcal causes, we ought therefore to exclude two, and some others are certainly very imperfect. So that it must be said that the evidence, as compared with that of the cases of communicability, is loose.

Again, even within the last year, we have had additional proof of the occasional introduction of typhoid by milk, and by clothes soiled with typhoid discharges (which is admitted by Murchison, p. 467), and possibly other undetected ways of entrance may account for a poison from without being really brought in and yet overlooked.

Still there are cases in which we cannot fairly assume such an explanation, and, till the evidence is much more complete, Dr. Murchison can hardly be dislodged from his position.

Again, his second argument is really a strong one; if we suppose the typhoid evacuations to contain the agent (and this will probably be doubted by few), how is it that this disease in many instances does not spread, and persons who treat typhoid fever in hospitals often deny the communicability from their own experience? There is one class of facts often noticed (by Piedvache, Budd, Ballard) of great interest; it is this—in the undoubted instances of communicability in small country districts, the cases which first occur in succession to the imported case very often arise in a month or 5 or 6 weeks from the period of the importation. In addition to the period of incubation, there is another period during which the agent produces apparently no effect. To account for this, Budd falls back on the old hypothesis of Thiersch and Pettenkofer with regard to cholera, viz., that a certain change or separation from entangling matter, or growth, has to go on after the discharges have passed before they become active. It is difficult to prove this in the absence of experiments (which of course cannot be made, as human typhoid is not communicable to animals), but it seems a reasonable explanation. If so, Murchison's second argument loses much of its force, as a reason would be given for the frequent non-communicability of the disease in hospitals and city houses where there are sewers, and the dangerous evolution is therefore after the evacuations have passed into the sewers, and are at a great distance, it may be, from the house in which they originated. Such, then, is the position of this part of the etiology of typhoid as left by these two eminent writers. It seems to me an undecided position, but with the stricter evidence in favour rather of Budd than Murchison.

Neither writer discusses fully Pettenkofer's soil-hypothesis; Murchison (p. 450) dismisses it in a paragraph, though he does not doubt its action in Munich, but considers it (and no doubt justly) as too partial. Budd does not do this view justice, though it is not really inconsistent with his opinions, since the process of separation from other inactive matters, or growth, or whatever it is, after the passage of the typhoid evacuation, may go on *in* the soil as well as *on* it or in water.

In spite of this diversity of opinion, it is satisfactory to think that there is really a good deal of agreement, and that the same measures of prevention would be adopted by both writers. Murchison's principles lead him, of course, to obviate any chance of putrid sewage effluvia being inhaled or passing into drinking-water or food. He would therefore add disinfectants to the discharges, as well as take other measures for avoiding the breathing of sewage air. Budd, of course, puts the greatest reliance on the disinfection of the discharges, and asserts he has never seen the disease spread when this is done, though the fact that it often does not spread when it is not done lessens the force of this argument. For disinfecting the evacuations Budd recommends chloride of lime, chloride of zinc, carbolic and sulphate of iron, or a

* One great difficulty in enquiries into the origin of typhoid is the very long, uncertain period of incubation and the undefined insidious commencement of the disease. I have notes of an undoubted case in which the disease appeared 29 days after exposure; and other instances as long are on record. Many observations appear to me to be vitiated by this long period of dormancy.

mixture of the two last. As to quantities, he lays down the golden rule, "to be lavish in the use of the chemicals rather than to run the terrible "risk of failing by default."

Turning from these two works it will be of interest to give a few lines to the discussion at the Medical Society of Munich already referred to. Wolfsteiner, v. Pettenkofer, Buhl, v. Gietl, H. Ranke, and Friedrich took part in this, and the debates are of extraordinary interest.

Dr. Joseph Wolfsteiner, who opened the debate, made a very vigorous attack upon Pettenkofer's ground-water theory, to which he gives not the least assent. He looks at enteric fever precisely as Budd does; it is for him a transportable and contagious disease, and he cites a very good example of its spread in a country place. A Jewish trader went from Munich to a village called Thalmässing when ill with typhoid fever; shortly afterwards a part of his family fell ill with typhoid, and then it attacked many, but chiefly Jewish families which had much intercourse from social and trading connections. From Thalmässing the disease was carried to the village of Tiefenbach, three miles off, and then prevailed there; a peasant's son in service at Tiefenbach went to his own village of Ebenricht, six miles from Tiefenbach; he fell ill there with typhoid, and then his family, partly at the same time, partly after him, took the disease. Previously there had been no typhoid in these villages or the neighbouring, and Wolfsteiner was able to trace all cases back to the imported case.

In a subsequent discussion, Professor H. Ranke narrated a case which is so precisely like that already given from Ballard, that it may be quoted. A young woman, who had lived in Munich for two years, got typhoid, and went to her own home at Pähl at the end of June, 1871. On the 10th of August her father fell sick with typhoid, and a brother, 10 years old, and both died; on the 23rd of August, the mother fell sick, and then two sisters, all with typhoid; in the beginning of September another child fell ill, and the other remaining was also attacked with great diarrhœa and prostration. Except in this family no other case occurred in the village.

This instance resembles almost all the others now recorded, in the localization of the disease, and in the first local cases occurring a month or six weeks after the imported case has arrived.

Besides upholding the transportable and, so to speak, the contagious nature of typhoid, Wolfsteiner strongly advocates its occasional spread through drinking-water, and he cites some remarkable instances of the diminution of typhoid when pure drinking-water has been supplied. Pettenkofer replied with his accustomed energy to this attack, and arrayed again the facts and the mathematical conclusions of Seidel, in the years 1856 to 1864, on the coincidences of the ground-water movements and typhoid prevalence. He mentions also that on extending his calculations over the years 1865 to 1873, Seidel found still the same result, viz., that it is 36,000 to 1 that the agreement between the curves of the ground-water and typhoid mortality is not an accident.* The carriage of typhoid fever from place to place; *i.e.*, its transportability is freely admitted by Pettenkofer; only he considers it not as a contagium (*i.e.*, a substance increasing only in the bodies of men), but as a miasma, *i.e.*, an agency which may adhere to clothes or men but increases

* In reference to the apparently undoubted influence of the sinking of the ground-water and the attacks of typhoid in Munich, and the want of evidence of the kind in many other places, there is one peculiarity of house construction in Munich which may have an influence in drawing air from great depths. The sewers carry away only house water for the most part. The houses, which are very large, have cesspools beneath, which are emptied by a hose and steam-engine from time to time; these cesspools are, in many cases, not cemented; and Wolfsteiner mentions that he inhabits a house with many inhabitants, and calculates that yearly 35 tons (English) pass into the cesspool under the house; yet in twenty years hardly 25 tons have been removed, so that in twenty years 675 tons of excrement have soaked into the ground. Now in Munich the warm houses help to draw the cesspool air into the rooms, and as the streets of Munich are beautifully paved, and no gas can escape through them the cesspools and houses must be the only ventilating shafts for the soil-air.

independently of them. In other words, man carries, but the locality brings forth; that is, as far as I can see, Pettenkofer's view both of typhoid fever and cholera.

This reply of Pettenkofer brought forth an answer from Wolfsteiner, and this again elicited an answer from Buhl and another from Pettenkofer, to which Wolfsteiner once more replies. It would demand too much time to go through the arguments, which indeed turn very much on the points already noticed in speaking of the English books.*

I pass on to notice the dissertations of Professor v. Gietl and H. Ranke. The former is well known for his publications on typhoid, and in this debate he repeated his conclusions; for him "enteric typhus" is a specific "putrid "intoxication;" its local action is a catarrh of the alimentary canal; its specific action is on the intestinal and mesenteric glands; it is a poison-disease; the evacuations are the bearers of this poison, and may certainly carry the disease (and on this point he refers to his former evidence); the activity of the poison is very durable; in great cities it is impossible to trace the communication; in the country this can generally be done. Hence in towns medical men deny the contagious properties of enteric fever, in the country admit them; the experience of many years has convinced him that the poison-bearer must be a minute colourless body, perhaps a fungus or spores, which is everywhere deposited and continues long to live, for some barracks and large houses or even some rooms are especially liable to cause attacks.

These opinions of v. Gietl seem almost identical with those of Budd.

Professor H. Ranke debated with great care the question of the contagion of typhoid; he cites authorities and examples, and narrates some of his own experience, of which part has been already quoted. He does not doubt the introduction into a place by typhoid patients, and he shows very well that the discussion, whether this is by a "contagium" or a "miasm" (to take Pettenkofer's definition) is useless. These terms are for him mere conceptions or formulæ which are used for want of better. Yet he also firmly believes that typhoid can arise spontaneously, *i.e.*, when no importation or introduction can be proved; when it thus arises it is from putrid substances; either in the ground and giving off emanations, or in drinking-water, or (as in the case of Audelfingen in the Canton Zürich which Griesinger describes) through decomposing food. While fully believing in the occasional water-carriage,† he brings strong evidence against the universality of this mode of spread, and thinks it spreads much oftener through the air. As to the relation of ground-water changes and typhoid, he does not doubt the connection, but he does not quite see the reason of the connection; he inclines to the belief that the rise of the ground-water simply covers the effluvia-producing strata, but he questions whether there is not something peculiar in the soil, and he refers to observations which show that the fine sand lying between the coarser gravel in the Munich soil has an extraordinary power of holding fast nitrogenous substances; cold and even boiling water dissolves very little of the substances from the sand, but the water when evaporated has a disagreeable smell, like putrid glue. To these semi-putrid substances Ranke attributes much influence, and he mentions the remarkable fact that in the neighbourhood of Munich (with the same soil and, of course, rise and fall of ground-water) there is no typhoid except what is imported from Munich,

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* It may be noticed that Pettenkofer, in referring to Bryden's statistics of cholera in India, and basing on them an opinion that the European race is more subject to cholera than the Sepoys, has fallen into an error, from taking only the statistics of the Upper Provinces, where the Europeans have suffered from some cause much more than the Sepoys. But the experience of Bengal proper and of Madras shows that this was not owing to race.

† The view that typhoid can spread through drinking water is rapidly gaining ground in Germany. Biermer, from an analysis of more than 1,300 cases, cites evidence of water-carriage (Schmidt's Jahrb., 1873, No. 8, p. 195); and Geisler quotes from Häglei an extremely strong case of the spread through drinking water (Schmidt's Jahrb., 1874, No. 2, p. 185).

and at no time have great epidemics prevailed, but merely "house-epidemics." What is the cause of this difference? simply that the soil of these districts, otherwise similar to that of Munich, differs in having no fæcal or putrid contamination of the ground.

The last paper in this interesting debate was by Dr. Friederich, who related some valuable evidence of the villages and districts round Munich. In several of these there is no typhoid; when it is imported it does not spread, or not beyond the house into which the case is brought; also the same places remained free from cholera in cholera years; after giving very full details, Friedrich comes to the following conclusions:—

1. It may be said with certainty that a chain of typhoid cases would not have arisen if no typhoid case had come into the house.

2. It may also be said that a chain of typhoid cases may arise, without any of the sick having been in communication with a typhoid case.

The meaning of these two conclusions appears to be that while in some of these house-outbreaks the channel of introduction is evident, and it is certain that had not that channel existed no typhoid would have occurred, there are yet other outbreaks where no such channel can be proved.

3. Typhoid fever brought into a place can only be spread at certain times and under certain local conditions.

It will be seen from this short account of this able debate that the question of typhoid is in Munich pretty much in the same state as in England. The view that the disease arises from a specific agent; that this agent is transportable, is admitted; that it can arise spontaneously (*i.e.*, not derived from previous cases) is held by some; that it is truly contagious by others; that it spreads through the air by almost all; that it spreads through water and food by many, but not by all; that it is influenced by, and perhaps generated in the ground, and is greatly affected by the movements of the ground-water is generally but not universally admitted. There is, therefore, in both countries many points of common belief; and, as the matters are now clearly defined, it seems possible that we may soon acquire more definite knowledge on the questions which are still under discussion.

Propagation of Typhoid Fever by Milk.

In last year's Report, the remarkable case published by Dr. Russell of Glasgow was noticed; making now six or seven cases with good evidence. Last summer occurred the outbreak in Marylebone investigated by Murchison, in which also the dissemination by means of milk seems to have been clearly proved. The full details of the evidence have not yet been published, and I therefore defer all account of it till next year.

Yellow Fever.

The belief in the malarious origin of yellow fever, so long and tenaciously held by many American physicians, seems to be losing ground. In New Orleans it would appear from an able essay by Dr. Perry* that the agent is now considered to be a solid substance, both indigenous to New Orleans, and also being frequently imported. The following extract from the paper shows the views now held in that city, and are also of real interest in connection with the kindred facts in cholera and typhoid fever, both of communication and of periodicity.

"The solid germs in the case of yellow fever have not indeed been demonstrated, "but the close analogy between yellow fever, small-pox, measles, and scarlet fever "renders it beyond a doubt true that they do exist. The germ theory applied to "yellow fever is the only one that will fully explain and make agree the hitherto "apparently contradictory facts which have been observed in regard to the disease. "The spontaneous generation of yellow fever in New Orleans has been deduced from "the frequent cases in which it has occurred, in which there seemed to be no possi- "bility of its importation; these have been too numerous to be denied, but they

* Paper read before the American Health Association. "The Daily Picayune," Nov. 23, 1873.

" have been evaded by the invention of paludal or malarial yellow fever to which all " indigenous cases are said to belong. The yellow fever germ may be compared to " cotton-worm eggs. The cotton-worm was unknown in this country thirty-five " years ago, and must have been imported from some foreign country, as many other " insects destructive to vegetation are known to have been; the severity of our " weather in winter destroys all but a very few; perhaps not one out of a hundred " millions survives until the next season, except those which are hid away in warm, " sheltered places; these increase during the first warm, moist weather, requiring weeks " or months before they have become numerous enough even to be noticed. The im- " portation of the eggs of the cotton-worm in May or June would cause earlier " increase, and therefore greater ravages.

"The yellow fever germ is an exceedingly tender organism of foreign origin, not " developing below 70° Fahrenheit, and killed by a temperature of 32°. But of " millions of disease germs which exist at the close of an epidemic only few survive " some of our winters, and give rise to the cases of domestic or indigenous yellow " fever the next season. In some winters all the disease germs are destroyed, and " there are no domestic cases of yellow fever the next summer, or, perhaps, for " several summers, until the germs are again imported. If some germs remain over " from a previous summer, then the fever should occupy about the same neighbour- " hoods for several successive years, which it has actually done in the Fourth District " of this city (New Orleans) for the past three years. The fact of the indigenous " growth of yellow fever does not prevent the importation, or render useless a quaran- tine. The foreign yellow fever must be kept out, and the domestic destroyed or " delayed by disinfection. It has been found by past experience that yellow fever " does not develop into an epidemic here in less than fifty to sixty days. Indigenous " cases rarely occur before August 1, and this is so late that an epidemic cannot " occur. No epidemic has ever followed in this city when the first case has been as " late as August 1. Most, if not all, of our epidemics of yellow fever have resulted " from the importation of foreign yellow fever in May or June. If quarantine does " nothing more than to prevent the importation of the foreign disease, it is worth " far more than its actual cost to the State. The demonstration that disease germs " are solid bodies makes it logically impossible to exclude foreign epidemic diseases " by absolute non-intercourse, or by destroying the disease germs in transit. The " first is not to be entertained for a moment, and the second has hitherto signally " failed. Both cholera and yellow fever have been imported scores of times in New " York, Philadelphia, and New Orleans, through a so-called strict quarantine. All " these failures have occurred because the quarantine was not based on sound prin- " ciples.

" The following are instances in which the yellow fever has been brought through " a strict quarantine :—

"1871—To New York, by steamship 'Cleopatra.'

"1859—To New Orleans, by brig 'Elizabeth Ellen.'

"July, 1862—To New Orleans, from Key West.

"September, 1862—New Orleans, from Nassau.

"1871—To New Orleans, by brig 'Mary Pratt,' from Cuba.

"1873—To New Orleans, by bark 'Valparaiso,' from Cuba.

"To Penascola, by ship 'Golden Dream,' from Cuba. Kept 21 days at quaran- " tine.

"1870—To New Orleans, by steamship 'Agnes,' from Honduras."

Instead of quarantine, Dr. Perry advises a most rigorous system of disinfection.

Cholera.

During the year 1873 cholera appeared over a large part of Europe; it was very fatal in Hungary, but in all other places in Austria, Germany, Russia, Italy and France, it showed little inclination to spread rapidly or to attain large dimensions. It has been thought that this was owing to the great sanitary precautions and to the active disinfection everywhere brought into use.

During the winter of 1873–74 it has not, however, disappeared entirely, and in Munich it has run a rather peculiar course. Instead of rising rather rapidly to an acme and then declining, it has continued week after week, since July 1873 to the spring of 1874, to attack a small number of persons, and this persistency and comparative want of growth resembles that it has displayed in some Russian towns. The continued prevalence in Munich is interesting

when compared with the condition of the soil and the cesspools described in a previous page, and it really looks as if these conditions, combined with a water-supply tolerably safe from cholera impregnation, would explain both the persistency and the comparative want of large outbreaks. So much space was given in last year's Report to the subject of cholera that I shall defer a full discussion till next year, when, possibly, we may have more European experience. I shall only briefly refer to one or two points of interest.

If there is one fact in the spread of cholera which is generally accepted, it is that whatever be the nature of the cause it is capable of being carried by persons from place to place. After long years of debate this one fact seemed admitted, and though it could not of itself explain all the phenomena of spread (such as the periodicity; the curious cessation; the wonderfully rapid spread in some cases, *i.e.*, the assumption of the epidemic character; the want of spread in others); and though local conditions were manifestly of great importance, it yet seemed that the grand fact of portability and the consequent certainty that the agent was a solid body of some kind, created a reasonable hope, not only that we could destroy or stop this agent, but that our improved methods of research would at length identify it.

The Ninth Annual Report of the Sanitary Commissioner (Dr. J. M. Cuningham) with the Government of India declares that this popular view is entirely a mistake. This able officer who ought to have unusual means of forming a correct judgment, has written a Report which makes a *tabula rasa* of everything. He is a Revolutionist of the purest water, destroying all, and reconstructing nothing. The only impression made on reading this Report is, that if it be true, we know, in the strongest sense of the word, literally nothing about cholera. All the labour, all the energy of several generations have been simply so much empty talk. Transportality of cholera by persons is declared on the evidence of 108 outbreaks in India to be erroneous; the water-spread is a mistake; the entrance with food is not worth notice; and the passage with air cannot be at present affirmed. Yet cholera is spread, and must be something; what does Dr. Cuningham put in the place of all the beliefs which he tries to shatter? Simply the honestly expressed opinion that we have been on the wrong track; that we know nothing, and must begin again as if no observation had ever yet been made. That is a conclusion which common sense revolts at; and certainly it cannot be established without much more evidence than is found in this Report. For grant that in none of the 108 outbreaks in 1872 in Bengal was there carriage by human intercourse. This could not upset the many and indisputable cases of such carriage in other countries and at other times; it might show the carriage by persons to be less common than we supposed, but it could not go beyond this. But it does not even prove this for no one, with every wish to be perfectly fair, can read the evidence given to Dr. Cuningham by his reporters without feeling that it is quite insufficient. In many cases nothing is said but that communication could not be traced in such and such an outbreak. But surely we have a right to have something more than the *ipse dixit* of a man who may have taken no trouble; we may justly claim to have the evidence that the disease could not have been introduced clearly brought forward and every step demonstrated. At the very time when Dr. Cuningham finds that in no single outbreak in 1872 in the Bengal Presidency, was there any introduction of cholera by persons, cases of such introduction were being recorded in the Indian "Medical Gazette."

Dr. Cuningham's Report will no doubt reopen the question and lead to the accumulation of more perfect evidence; but I cannot but believe that future enquiry will lead him to modify his views.

It must, however, be admitted that Dr. Cuningham has very ably brought forward again one aspect of Cholera outbreaks which is often in danger of being forgotten. Besides transportability by human intercourse, there are other facts of which we know little; it enters a place in Upper India in successive epidemics almost to a day; it sometimes leaves off almost to a day; it enters a place and does not spread; in another place, apparently similar, it spreads rapidly; it drops here and there in one town so capriciously as to seem trackless; in another it attacks in successive epidemics the same street or even house. With his vast experience of cholera, Dr. Cuningham feels so sure that something yet unfathomed must account for all these

caprices, as they seem, that the doctrine of transportability appears to him hopelessly feeble as an explanation. He feels he must dive deeper still before he can find the pearl and he becomes impatient with an explanation which does not explain. But if transportability is true, as I conceive, that is surely the point to start from, for if correct it brings us in presence of a material something the changes and development of which we cannot but hope will yet be discovered by perseverance and skill.

In its progress through Europe some interesting observations have been made, but space will allow me only to notice one or two.

The effect of the Choleraic Evacuation on Animals.—During the prevalence of Cholera in Pesth in June and July, 1873, Professor Högges made a great number of experiments* on the influence of fresh cholera discharges on animals. The discharges were used from 1 to 1½ hours after being passed. The animals were healthy dogs and rabbits, and also dogs and rabbits in whom artificial gastro-intestinal catarrh had been previously produced, and then allowed to subside. The effect of cholera discharges when containing the usual corpuscular elements, and when freed from these, and also the effect of a current of air saturated with choleraic elements and also freed from them, or disinfected with carbolic acid, was determined. When not disinfected, injurious effects followed the introduction of cholera discharges in both ways, *i.e.*, by injection and through a stream of air. Carbolic acid destroyed the power. The conclusions are thus stated.

1. The fresh cholera discharge works injuriously on animal organisms, and as it appears in different degrees in different animals. 2. The principal, or the invariable appearance of the injurious action, after every mode of introduction of the cholera discharges is a more or less strong inflammatory change in the stomach and intestinal tract. 3. An artificially produced stomach and intestinal catarrh makes animals more susceptible to the injurious action. 4. The inhalation of a stream of air saturated with particles from non-disinfected cholera discharges can produce the same symptoms, as the immediate action on the stomach, rectum, or venous system, while the particles of the cholera dejection with carbolic acid are quite innocuous. 5. A stream of air carried off from the non-disinfected cholera discharges, little fungus elements which rapidly vegetate on favourable soil, while the fungus elements from stools disinfected with carbolic acid are incapable of growth. 6. The cholera discharges when freed from "form-elements" produce by their chemical constituents the same pathological action as when they contain their "form-elements." Professor H. Ranke (Cholera-Infectious-Versuche an weissen Mausen, München, 1874) has made many experiments on white mice, but in no case produced any cholera symptoms. He found that filtering-paper even unsoiled with discharges produced injurious effects on the mice. As filtering paper was used in the experiments of Thiersch and Sanderson, this may perhaps explain the difference of the results between their and Ranke's experiments.

The Water Carriage of Cholera.—A little pamphlet has been published by Professor Förster, of Breslau† on the spread of cholera by water; he believes firmly that cholera spreads by human intercourse; that it does not pass from man to man like small-pox, but in some mediate unknown way; that the condition of the ground and the water in the ground is of importance; that the poison can enter only in one of three ways, viz., through the respiratory tract; the digestive tract or the outer skin. He then passes to the immediate object of his pamphlet. In Silesia are many places which are cholera-free; if introduced the disease does not spread; Förster has examined into the conditions of these villages and finds only one character; in all these cholera-free places the water cannot be contaminated, being led from a distance, or otherwise safe from impurities.

He describes five towns of from 5,000 to 12,000 inhabitants which have remained free under these conditions of water, though some are low, marshy

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* "Centralblatt für die Med. Wiss.," 1873, *Nos.* 50 and 51, Nov. 1 and 8.

† "Die Verbreitung der Cholera durch die Brunnen." Von Dr. R. Förster. Breslau, 1873.

and crowded; and the disease has been introduced. He then describes a town (Glogau) with 13,000 inhabitants, half of whom have a water supply from a distance; the rest use wells. The former remained free, the latter were severely attacked. In another cholera-free place (Jauer) the water is not taken from a distance but from wells sunk in the rocks, and cannot be contaminated by soakage. He then describes three other cholera-free places where the water must be pure.

In reference to the possibility of wells being infected by cesspools he cites evidence that wells from 50 to 200 feet away were influenced by soakage in porous ground and perhaps even farther.

He relates a striking case in Breslau of the contamination of a well during the prevalence of cholera in 1866, and the immediate outbreak among 11 people in the house supplied by the water, and concludes his very striking series of facts with two recommendations which, if carried into effect, will, he thinks, prevent cholera from ever being epidemic:—

1. Lead to every town, even if at great cost, abundant and pure water, as indeed was done, he says, much better 2,000 years ago than now.

2. Protect the ground from contamination in any way from excrements, and banish all cesspits. The ground must be absolutely pure, and this can only be if all fœcal matter is removed to a distance.

Were these two recommendations carried out everywhere, perhaps the investigation of cholera would come to an end from lack of material.

An instance in which the substitution of abundant pure, for contaminated, water supply seemed to produce in two ways an almost complete immunity from cholera is given by Sernon.* Dantzic is a city which in all former epidemics of cholera has been heavily smitten, in common with Königsberg. In 1871 the cholera spread from Russia, and as usual entered Königsberg, where, from the time of the importation (Einschleppung) of the first case on the 26th July, to the 14th October, 2,880 persons were attacked and 1,568 died. Now, as in the former epidemic Dantzic lost almost as many as Königsberg, great fears were entertained that the same result would also now follow. But, on the contrary, although the disease was imported into Dantzic several times there were, from the 1st August (date of importation) to the 3rd October (date of last case), only 60 cases and 46 deaths out of 90,000 inhabitants. What, then, was the cause of this immunity? Two great sanitary works had been going on in Dantzic:—great drainage works, planned by Mr. Baldwin Latham, had been nearly but not quite completed when the cholera appeared. Although these new sewers had not been used, and therefore could have had so far no effect, they had had one influence; they had dried the soil, and, greatly lowered the level of the ground water, as was proved by measurements. The soil was, therefore, in the exact condition when, according to Pettenkofer, it should have aided the outbreak of cholera. Yet it did not do so. As Sernon says, there were given "all conditions for Pettenkofer's Y, and as "there was no want of X, it was feared that an outbreak of the worst kind "would take place in this town notorious for the prevalence of cholera. But "it was otherwise. An epidemic so unimportant that it could hardly be "called one, formed a contrast to the Königsberg, as to all former Dantzic, "epidemics. We obtained thus a new argument against the general appli-"cability of Pettenkofer's doctrine, which was also strengthened by the later "direct water-level measurement." (P. 181.) The second sanitary work was the supply of extremely pure water, which had been completed and was in use at the time. Was this the preservative agency? To us in England it will appear exceedingly probable, and Sernon asserts this to a certain extent. Yet he hesitates to ascribe it only to this, as it seemed as if the cholera had, during 1871, less tendency to spread and develop than usual, and, in addition, the abundant supply of water permitted a constant washing out of the old sewers, and instead of the former sprinkling with solution of sulphate of iron, the abundance of water permitted hydrants also to be placed for flushing as well. To this Sernon thinks much influence may have been due, and certainly the drinking of the pure water, and the purification of the surface and of the

* "Deutsche Vierteljahrsch. für öff. Gesundheitsff," Band iv, p. 169.

drains by its abundant supply, are more reasonable explanations of the non-prevalence of cholera than the assumption that the agent had lost the power of spread. It had, in fact, prevailed heavily in the very vicinity of Dantzic, and we ought, therefore, to be careful in falling back on what is a mere assumption.

An account of a place in India made cholera-free may appropriately follow Förster's Essay and the Dantzic experience. Surgeon P. Cullen† describes an attack in Hurda, which was traced to water; the evidence is too long to give in detail, but seems strong. At any rate, very grave suspicion attaching to the water of a stream, it was cleared out, its bed purified, and also several wells were cleaned out. The inhabitants were cautioned to boil the water, and small wells were dug by the side of the stream. "Under these steps the disease "died out, and the place was put into such a good sanitary condition that, "although the disease was brought there several times by railway travellers, "it never spread." It was brought to Hurda subsequently four different times.

Another statement from the same author may be given.

At Bhamungaon, 300 coolies were working on the south of this village; they took their water from the "stagnant pools" of a nullah; on the south side was one well, from which all the villagers drew their supply. On the 26th December, 1871, a traveller came from towards Seoni (*i.e.*, on the Hurda side) suffering from cholera, and lay down in the coolies' encampment and died. No other case occurred until the 30th January, 1872, when a cooly was attacked and died next day, and then the disorder spread, and up to the morning of the 8th there were 11 cases and 8 deaths, when the coolies were dispersed. The coolies had constant communication with the village, yet there was not a single case among the villagers, owing, it is supposed, to their different water supply. The coolies dispersing did not, it appears, carry the disease.

A singular local outbreak at Etarsi is thus recorded by the same writer:—
"On the 6th February, 1872, a party of pilgrims were proceeding from Poona to "Benares, and travelled by mixed train, which had stopped on the previous "night at Hurda. One of their number was seized in the train and removed "at Etarsi, and found his way to the Serai, and died on the 7th. On the 9th, "a barber, who lived in the Serai, was attacked and died on the 10th. On "that day a woman living near the railway station was seized and died, and "a fakeer, who had been living for some time in the Serai, was seized with the "disease, and made off to Hoshungabad, and unfortunately got into the town "before he was detected; he died at Hoshungabad on the 13th, and on the "night of the 12th, a man, who had just arrived from Hurda, was attacked, "but recovered. On the 12th, another man, who had put up at the Serai at "Etarsi, was attacked, and walking towards Hoshungabad died at Beova, "half way. On the 14th, two men went from Adamghur (a small village "adjacent to Hoshungabad, to Etarsi) and stayed all night at the Serai, and "were both of them attacked, but hastened home as fast as they could, got "treatment, and recovered. The Serai, in the mean time, had been cleaned "out, whitewashed, and partially disinfected, but, on the 27th February, two "more men went from Adamghur to Etarsi, stayed at the Serai, were attacked, "and both died. The Serai was then entirely closed for a long time, the floor "of the huts dug up and relaid, and the whole place whitewashed, and, on its "being again opened to the public, it was found free from taint. The village "of Etarsi, containing 1675 souls, lies about a quarter of a mile to the south-"east of the Serai, and is in constant communication with the railway station, "but not a single case occurred here." The cause of this localization was not made out.

The Microscopic Elements of Cholera, Blood, and Discharges.—Professor Eberth, of Zurich, in his work on Bacteria,* mentions that, though the importance of "micrococci" for diphtheria, pyæmia, and many skin diseases is proved, he has been unable to get clear evidence of the presence of such

* "Zur Kenntniss du Bacheritischen Mykosen." Von C. J. Eberth. 1873.
† "Indian Medical Gazette," July 1, 1873.

parasites in cholera. The cholera stools and the intestinal fluids show only seldom, he says, some intestinal epithelium. But when the detached (or adherent ?) epithelium is examined, it never presents any noteworthy changes, except little granules, of the size of micrococci, which, on further examination, are proved to be simple oil globules. The principal constituent of the cholera stools is constituted by the lower organisms, among which the customary micrococci (both in colonies and individualized) are the most frequent, and, with these, are still or moving rod-bacteria. The so-called cholera bodies of Brittan and Swayne, and the cysts of Hallier, are, according to Eberth, little balls of leucin. Accidental elements of cholera stools are spores of aspergillus, penicillium, mucor, tilletia, yeast-cells, &c., but these are not more frequent than in healthy persons. Once he found a tolerably lively amœba.

In the blood of cholera he could find neither micrococci or any other foreign body. He thinks that perhaps the "cholera-bacteria" in the intestines call forth peculiar decomposition processes, which produce inflammation of the intestines; and then, through the copious transudation, the other cholera symptoms follow. But he leaves undecided the point whether a general infection takes place from the intestines, and whether changes in the various tissues of the body are not the causes of the enormous drain of water.

It appears, therefore, that Eberth confirms Lewis and Cunningham as to the absence of anything in the blood, but attributes more importance to the lower organisms in the stools than they do.

Malignant Pustule.

Davaine* gives an account of some experiments on the disinfection of the virus of "Charbon" (malignant pustule). The virulent principle of the blood of malignant pustule is, he says, "constituted by little vegetables of the "family of vibriones, which I have called 'bacteridia.'" A temperature of 51° Cent. (=125° Fah.), if kept up for half-an-hour, destroys the power; a temperature of 55° Cent. (=132° Fah.) destroys it in five minutes. Yet, when dried and then heated, it was found that even a temperature of 100° Cent. (=212° Fah.) did not destroy the power. When less than $\frac{1}{100000}$ part of a drop of the blood of a malignant pustule animal is put, with a syringe of Pravaz, under the skin of a guinea-pig, it always kills the animal. Taking advantage of this, Davaine used the following antiseptics, in which the weakest disinfectants come first:—Ammonia (weakest, $\frac{1}{200}$ part required); silicate of soda, vinegar, carbolic acid, caustic potash, chloride of soda, hydrochloric acid, permanganate of potassium, chromic acid, sulphuric acid, iodine. Of these, iodine was, by far the most powerful ($\frac{1}{120000}$ part was effectual). Davaine found iodine might be injected into the skin without injury. It would seem desirable to try this agent against syphilis and snake-bite.

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* "Comptes rendus de l'Acad.," Nos. 13 and 15, Sept. and Oct., 1873.

APPENDIX No. II.

AN ILLUSTRATED REPORT ON THE CHEMICAL AND MICROSCOPICAL EXAMINATION OF THE POTABLE WATER OF CAPE COAST CASTLE DURING THE LATE ASHANTEE WAR.

By Joseph Fleming, M.D., F.R.C.S., Surgeon and Pathologist to the Expedition.

Cape Coast Castle is situated in lat. 5° 6′ N. and long. 1° 5′ W., on elevated ground, rising gradually from the sea to a height of from 60 to 80 feet. The town is washed on the south and east by the sea, along which it is built, with about a mile frontage, and the same distance inland. It is surrounded on the north and east by low hills varying from 100 to 300 feet high, covered with dense brushwood, and partly composing the latter the following plants, &c., were recognized—the passion-flower order, prickly pear, wild indigo, thorn-apple (*stramonium*), sensitive plant (*desmodium gyrans*), cotton (*gossypium herbaceum*), convolvulacea, &c.

On the east and west of the town there are two shallow valleys or water-sheds, into which there is evidence the sea at one period flowed, and from which the inhabitants chiefly obtain their drinking water. The geological formation varies much. Near the sea, granite and gneiss rocks, rapidly undergoing disintegration, are generally met with; while the more elevated parts of the town are composed of a soft, porous, sandy soil, mixed with clay, which in places is red and white, and gives a peculiar appearance to the strata. The soil generally is full of mica, and patches of pure quartz are frequently met with. The hills around are composed of a red-and-white stratified clay mixed with gravel, while the soil of the valley is rich dark clay, full of vegetable matter.

The sanitary condition of Cape Coast Castle is very indifferent, and no doubt it has been so for many years; yet this is not surprising, when one considers the utter disregard of the natives for cleanliness in and around their habitations, and the peculiar absorbing and retaining nature of the soil.

I have heard that it was the custom not long ago to bury the dead (at no great depth either) in the dwelling-houses. At present the castle-yard is almost covered with gravestones, indicating also that the place of disposal of the dead was a matter of indifference.

From the nature of the soil therefore, as well as from the customs of the inhabitants, it will be readily understood that the drinking water is subject to contamination. The natives appear to have found out from experience that the water of many wells in the town is really impure and injurious to their health, producing dysentery, diarrhœa, &c., and therefore go to some distance in the country for it; though that in many parts of the town is still much used, as a visit to the wells any morning will show.

The wells near the market-place may be taken as affording an example of this town water, and probably not the worst example, as the water appears to be in very great demand. Here, as indeed in every other part of the town and neighbourhood, the wells are simply pits in the soil, circular or oval in shape, about 4 feet average diameter, and without any brick or stonework. The sides therefore are constantly falling in, and when the well is thus injured it is abandoned and a new pit dug instead. I noticed some wells in the town and neighbourhood covered with a trap-door, which could be locked, not with the object of keeping the water pure and free from contamination (for often the

mouth of the well is some feet below the surrounding surface), but to prevent it from being used generally by the common classes.

The average depth from the surface of the market-wells, of which there are four, is 8½ feet, and on the day of examination each contained 2 feet of water nearly, which was being rapidly carried away by water carriers.

These wells are situated apparently amongst old ruins, within a few yards and in rear of a range of native houses and 150 yards of the sea, a very filthy pool intervening.

The ground around them is sodden and wet, and in a very insanitary condition.

The results of the chemical examination of a specimen of this water are given in the accompanying tabulated form No. II., from which it will be seen that it is very impure.

It contains a great deal of organic matter, chlorine, and nitrates, and solids. the latter amounting to 147 grs. per gallon, while the volatile matters are as much as 21 grains per gallon.

The hardness, as indicated by the soap test, shows a total of 37·1 ; permanent, 16·8 ; and removable, 20·30 grs. per gallon. The water therefore is a bad water, injurious to health, and should not be used.

The wells at Aboom or Abookissum, about eight in number, are situated in a shallow valley in the suburbs, about two miles in a north-westerly direction from the Castle. They are very much frequented by the people, as the water is considered of superior quality. The soil in the well space, about half an acre in extent, is alluvial, with much fine white sand and clay, and covered over with brushwood and decaying vegetation. A great number of the wells are not used, as the sides have fallen in, and the water has become black and putrid from decomposing animal and vegetable matters, such as dead rats, snakes, &c., which I noticed there on various occasions. The wells in use are only a few feet from these old ones, and cannot possibly be free from impurity.

The water from all these wells is of a milky whiteness when drawn, owing to the fine sand and clay having been washed from the sides, and contains many extraordinary forms of animal life. The principal things noticed by microscopic examination were worms, annulated and ciliated, dead insects, hairs of rats or bats, water fleas, live insects, starch granules, ova, mica, sand, paramecia, fungi, algæ, &c.

The results of the chemical analysis of this water are given in the tabulated form No. III. It appears that the most objectionable constituent in it is the organic matter, as shown by the large quantity of volatile solids, amounting to 7 grs. per gallon.

Organic matter was indicated in quantity by the chloride of gold solution.

The hardness is comparatively little, and consequently the water is in great demand for washing purposes ; and the place is a chief resort for washerwomen and others, who wash themselves and their clothes on the well's brink.

The microscopic analysis shows a wonderful amount of animal life, and this alone would be sufficient to condemn the water for drinking ; but these various forms of life are possibly useful in getting rid of the noxious organic matter, whatever may be their effects on the human system.

Very good water can evidently be obtained if desired in this locality ; but unless the wells were properly constructed, and the place kept in a good sanitary condition, its quality would shortly deteriorate.

Katakraba Wells (about ten in number, five of which are in use) are situated at the foot of Prospect Hill, to the left of the Coomassie Road on leaving the town, and about a mile and a quarter from the Castle in a north-easterly direction. The soil is alluvial, and of the same nature as that of Aboom, but without any brushwood on the well-space, which is about an acre in extent. The ground shows marks of old wells, which have been filled in or neglected, and some contained very filthy-looking water. The average depth of the wells was 13 feet ; depth of water, 2½ feet ; and diameter, 4½ feet. Water from a well most in use and in the centre of the space was taken for examination, so as to get a fair representative specimen.

I may here notice that, unfortunately, during the late epidemic of small-pox, upwards of sixty bodies were buried (very superficially too) 150 yards above those wells higher up the valley, and about 3 feet higher level. In

consequence of this these wells must very shortly become contaminated; and the porous nature of the soil, and the natural drainage leading down to the wells from the graveyard, will greatly assist pollution, independent of the heavy rains and the existing trench which passes direct from the burial-ground between the wells.

It appears to be a most unpardonable offence to have buried bodies in such a situation, seeing that many suitable places exist in the neighbourhood. The results of the examination are given in the tabulated form No. 1.

The water, in appearance, resembles that of Aboom, and contains more nitrous acid than any of the other waters, indicating a serious impurity. The microscopic forms were not so numerous as in the Aboom water, but some were peculiar to it and very curious. Worms, algæ, fungi, paramecia, &c., were observed. It was not considered advisable to examine the collected rain-water stored in tanks in the Castle, nor would time have permitted more than a very superficial examination of it. A condensing engine was at work day and night for the supply of hospitals and barracks, and produced good water in abundance. This condensed water was passed through, in the majority of cases, what appeared to be silicated carbon filters, the result being that the water acquired a considerable degree of hardness.

The quantity of chlorine in the Katakraba and Aboom water has not been given, owing to some mistake that could not be rectified in the short time at disposal, but it was no doubt considerable.

From the foregoing examination it is evident that the market wells ought to be filled up, and new ones made in a proper way (the sides being brick or stonework) in a new site which can be found on the opposite side of the road-way, near the Mission-house. Good wells, affording as good water as can be obtained, appear to be indispensable in this locality, on account of the great number of people who frequent the markets. New wells, properly constructed, ought also to be built at Aboom and Katakraba, in new ground, and at a distance from the old ones outside the contaminated area.

At Katakraba water could be obtained to the right of the graveyard, and on account of the latter it would be advisable to go higher up the valley, where a capital supply and of good quality is available. Excellent water can also be obtained at Aboom, and even half a mile nearer the town if desirable; but it seems a waste of labour to help those who will not help themselves.

CHEMICAL Examination of Cape Coast Well water, 31st January 1874.

	Locality.		
	Katakraba Wells.	Market Wells.	Aboom Wells.
I. PHYSICAL:—			
Colour..	Whitish.. ..	Clear	Whitish.
Transparency	Clear on standing	Transparent ..	Turbid.
Taste	Flat	Brackish.. ..	Flat.
Smell	Slight smell of organic matter.	Smell of sea water.	Peculiar smell.
II. CHEMICAL:—			
Suspended matters ..	Animal and vegetable, &c.	None	In quantity.
Amount	Variable.. ..	,, ...	Variable.
Nature..	Sand, fine clay, vegetable, &c.	,, ...	Sand, clay, vegetable matter, &c.
Qualitative Results.			
Reaction	Faintly acid ..	None	Faintly acid.
Organic matter by gold chloride or perm.	Present	Present	Present.

	Locality.		
	Katakraba Wells.	Market Wells.	Aboom Wells.
II. CHEMICAL—*cont.*			
Lime	About 6 grs. per gallon.	In quantity ..	A trace.
Magnesia	Present	Present	Present.
Chlorine	About 10 grs. per gallon.	About xx grs. per gallon.	A considerable quantity.
Sulphuric acid ..	Present	In quantity ..	In large quantity.
Phosphoric acid ..	None	None	A trace.
Nitric acid	„	Present	„
Nitrous acid	Present	„	None.
Ammonia	None	None	„
Iron	Present (Ferric salts)	Present (Ferric salts) .	Present (Ferric salts).
Sulph. Hydrogen ...	None	None	None.
Lead	„	„	„
Quantitative Results.			
Total solids	35 grs. per gall.	147·0 grs. per gallon.	17·5 grs. per gall.
Fixed solids	30·80 „	126·0 „ „	10·5 „ „
Volatile solids.. ..	4·20 „	21·0 „ „	7·0 „ „
Total oxygen required to oxidise in presence of an acid and at a temperature of 140°.	·00104 grms. per litre.	·00069 grms. per litre.	·00089 grms. per litre.
Chlorine	.. .. ..	48·3 grs. per gall.	
Ammonia	None	None	None.
Total hardness ..	8·75 grs. per gall.	37·1 grs. per gall.	4·2 grs. per gall.
Permanent	6·65 „ „	16·8 „ „	2·10 „ „
Removable	2·10 „ „	20·30 „	2·10 „ „
III. MICROSCOPICAL ..	Worms, acari, algæ paramecia, &c.	Time too limited for an examination.	Worms, insects, and various forms of life.

Vide Drawings and decriptions of microscopic objects.

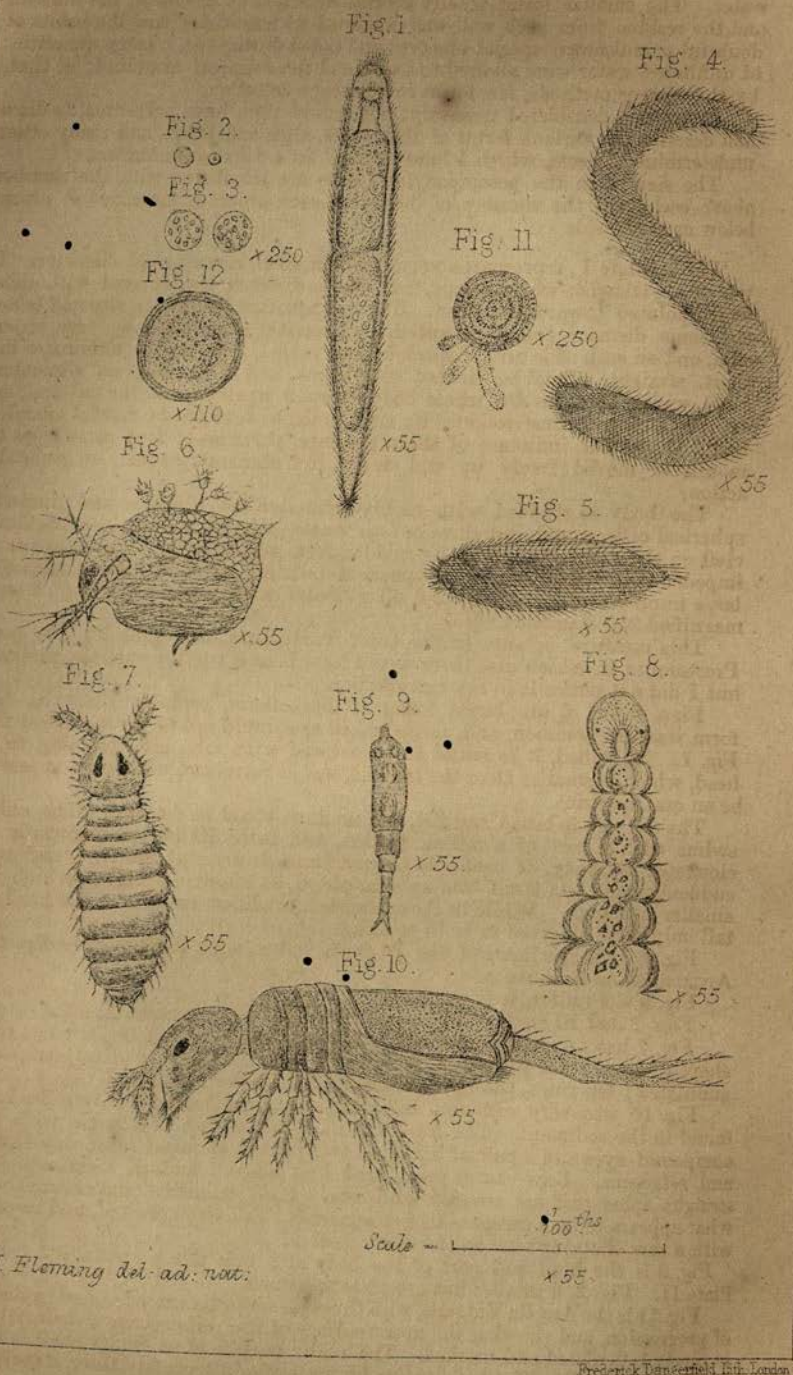
Microscopical Examination of the Well Water of Aboom, or Abookissum.

That water, when drawn, has a peculiar smell, as if some decomposing organic matters were present; and when placed in a clear glass bottle and held up to the light, numbers of white-looking vermiform bodies (*Turbellaria*) were observed, varying in size from about $\frac{1}{50}$ to $\frac{1}{8}$ of an inch in length, and swimming freely and rapidly in every direction. Two varieties of the above were extremely common, as well as water fleas (*Daphnia*), cyclops, and insect larva visible to the unaided eye.

Before entering into a detailed account of the forms of life met with, it may be as well to state briefly the methods adopted to procure the specimens.

Those forms visible with or without the aid of a lens in a quantity of water were readily procured by a pipette and examined in an animalculæ cage; but for others more minute a method of filtration was had recourse to. I obtained a number of pieces of fine clean muslin, six inches square, and some wide-mouthed collecting bottles (empty quinine bottles were used), and I filtered through the muslin a few gallons of water from each well and placed the residue, carefully folded up in the muslin, in a small quantity of distilled

Plate I.



Frederick Dangerfield, Edin. London

water. The smaller forms readily became detached by unfolding the muslin, and the residue from each well was examined without delay, and the habits of doubtful or unknown species observed and noted during life. Large quantities of unfiltered water were allowed to settle, and the sediment examined; so that, by the various methods, few forms could escape detection.

It was not considered necessary, nor would time have permitted, to draw and describe the various forms of diatomacea, algæ and fungi, and many other undetermined objects, which I have reserved for further examination.

The figures in the accompanying Plates are numbered with the number above each, and the number of diameters each object is magnified is placed below or at the side.

Fig. 1, Plate I., represents a very common form, magnified 55 diameters. It was of a yellowish-white colour, flat, like a distoma, and covered with cilia, which pointed towards the head. The oral aperture is circular, situated below and some distance from the anterior extremity, surrounded by very strong cilia, and on each side an eye-speck is observable. The mouth terminates in a short, straight, dilatable, ciliated œsophagus, and leads into an alimentary canal, which occupies the whole body except a small part of the tail end, and exhibits a central constriction. No anus could be detected by careful examination. Under the influence of slight pressure, particles of food came from the mouth or moved freely up and down the alimentary canal by peristaltic action. Plate I.

The body is studded with highly-refractive oil globules and nucleated spherical cells, containing three or four nuclei, and has a slight constriction or cleft on the right side about its middle, from which, when its movements are impeded or confined, nucleated spherical cells are extruded (one at a time) in large numbers. These cells and oil globules are represented in Figs. 2 and 3 magnified 250 diameters.

This creature belongs to the order Turbellaria, and probably the genus Prostomum, in which case there would have been a lengthy exsertile proboscis, but I did not notice it in my examination.

Figs. 4 and 5 are larval forms of Turbellaria, probably Planaria. This form was also common, and, to the naked eye, could not be distinguished from Fig. 1. Magnified, it is found to be covered with cilia also, pointing to the head, which is smaller than the tail end, and is furnished with what appears to be an oral aperture.

The tail end is broad and flat, and no anus could be detected. The animal swims with a sort of a rolling motion, and turns its tail end upwards and elongates its body, if confined, to pass through a small aperture, and often suddenly contracts itself into an oval shape, as shown in Fig. 5, which is a smaller specimen. While in the contracted condition the cilia at the head and tail only were observed to be in motion.

Fig. 6 is a specimen of the Daphnia pulex, with parasites (the Epistylis Anastatica) on its dorsum.

Fig. 9 is a rotifer, very common.

Figs. 7 and 10 are larval forms of insects at present undetermined.

Fig. 7 has two compound eyes—two palpi with three lobes, the last club-shaped. Legs, three pairs each, terminating with a single claw. Body setaceous annulated; ten rings, the last terminating in two short spines.

Fig. 10 was very common, and all the specimens observed were dead and found in the sediment. The head was shaped like that of a turtle, with two compound eyes and a pair of antennæ, two-jointed, terminal joint club-shaped and setaceous. Legs—three pairs, hind legs longest, and all terminate in a straight spine and are covered with setæ. Body annulated and covered with what appears to be a carapace in five segments. Tail thick, forked, and covered with a row of strong setæ on the upper surface.

Fig. 8 is the head and part of the body of a naïs much contracted. *Vide* Plate II. Fig. 2, a smaller but complete specimen.

Fig. 11 is the Arcella Vulgaris, with three pseudopodia extended, and in the act of progression, and showing the upper surface of the yellow-brown shell, which is nicely reticulated and marked. The under surface of an empty shell is seen in Fig. 2, Plate V. The body moves by projecting alternately three structure-

less, transparent, delicate processes, which, when made fast to any substance, contract, and thus effect locomotion.

Fig. 12 represents the appearance of a very common and undetermined ovum.

Katakraba Well Water.

Plate II. Fig. 1, Plate II., is a valve of a remarkable diatomacean frustule which still retained at the time of examination some of the amber-coloured endochrome. Fig. 2 represents the appearance of a very voracious naïd (annilidæ) common in the sediment. Fig. 8, Plate I., is the head and part of the body of a larger-sized specimen in a contracted condition. They are very voracious and eat up small particles of vegetable matter greedily. The head is flat, and resembles in shape a duck's bill, very moveable, with an oval oral aperture beneath, and surrounded with strong cilia, and situated some distance from the anterior margin of the head. These creatures appeared very active, moving in every direction, and were constantly in search of food, which was grasped by the strong cilia surrounding the mouth, and drawn by means of a ciliated œsophagus, assisted by vermicular action, into the alimentary canal. The latter appeared a straight tube, with corrugated sides, and terminated in the anus at the extremity of the tail, which was cleft. Under slight pressure, or when the worm wished to extricate itself, or reduce its bulk, particles of food passed freely out of the oral aperture and anus by vermicular action. It moved also backwards with great facility when trying to free itself from any difficulty that intercepted its progress. The body, indistinctly annulated, is covered with minute red, highly refracting globules arranged in rows round the head and oral aperture, and has a row of setæ in tufts of three on each side arising from the constrictions.

Fig. 3 is a species of auguillula very common, and always in a state of great activity. Its motion through the water resembles that of an eel, and occasionally it coils itself like the young of dracunculi, and has the appearance of an oral aperture at the extremity of the head, and a stomach in the upper fourth of the body. The tail terminates in a minute filament by which it makes itself fast to vegetable fibre, &c., by a few coils.

Fig. 4 is a cheyletus, similar, as far as I can make out at present, to a specimen obtained in India in 1868, and was by no means uncommon.

Fig. 5 is a flagellate infusorium with a single flagellum in front, and a caudal process behind. It was of a yellowish colour, containing small circular bodies in its interior, and belongs to the genus cercomonas.

Fig. 6 is an infusorium probably allied to Fig. 5, but no flagellum was observed, and one extremity was obtuse, the other pointed. The colour was a light brown, and there were clear spaces at each extremity, and an oval, clear space in the centre of the body.

Fig. 7 is a vermiform and apparently undescribed animal very common in the sediment from the water of Katakraba Wells. The body is filiform, and dotted at regular intervals with minute, reddish brown refractive globules of oil, with an intervening, clear, structureless substance; and with the assistance of a magnifying power of upwards of 1,200 diameters no markings or appendages could be detected.

There appears no distinct separation between the head and body, but at the apex of the former there was observed a circular opening which contracted and expanded slowly.

Currents were noticed on each side of the creature, as it moved through the water, and particles of vegetable matter were thrown off from the surface of its body, apparently by the action of cilia. Its strength was considerable, and out of proportion to its small size, as it turned large particles of silica, &c., out of its way, and never rested until it was safe out of sight in fine mud or amongst vegetable matter.

Fig. 8, Plate II., and Fig. 1, Plate III., are naïds probably sexually distinct. The former is a good example of Okens genus Proto, having radiating ciliated processes surrounding the vent, and in this specimen there are four on each side.

Plate III. Fig. 1, Plate III., is a specimen with three ciliated processes on each side of the vent, and the tail terminating in a forked appendage. The bodies are

Plate II.

Fig. 1.

×110

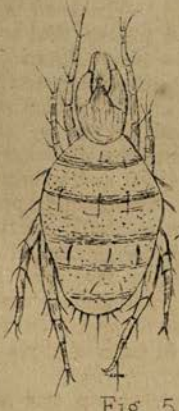
Fig. 3.

×250

Fig. 2.

×55

Fig. 4.



×55

Fig. 7.

×475

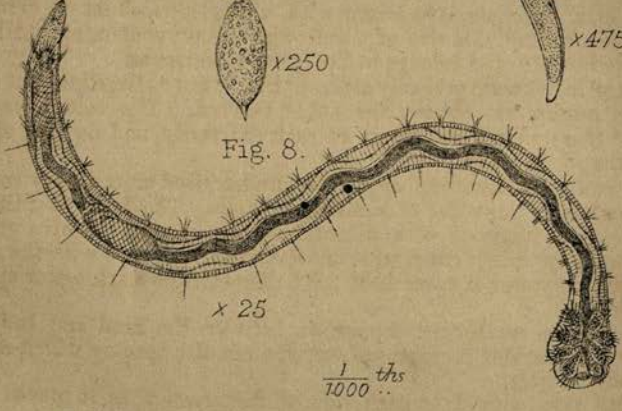
Fig. 5.

×250

Fig. 6.

×475

Fig. 8.



× 25

$\frac{1}{1000}$ ths

Scale —

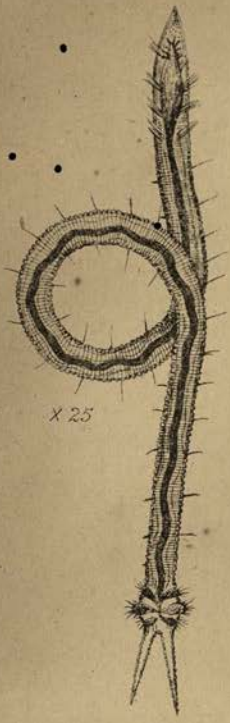
× 475

J. Fleming del: ad: nat:

Frederick Dangerfield, Lith: London

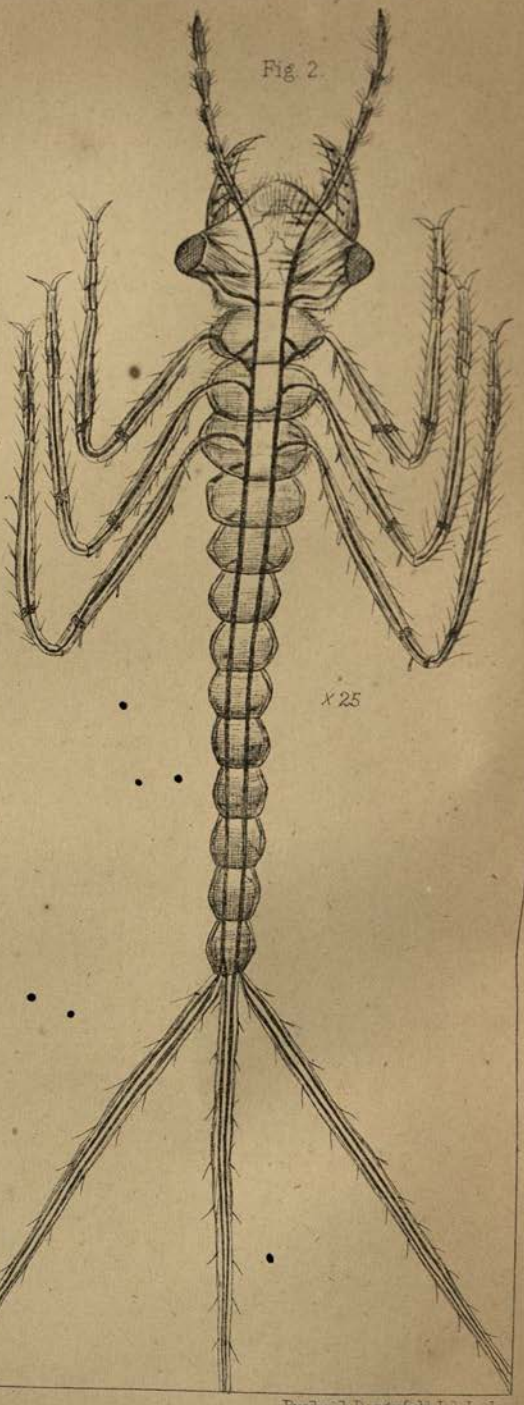
Plate III.

Fig. 1.



X 25

Fig. 2.



X 25

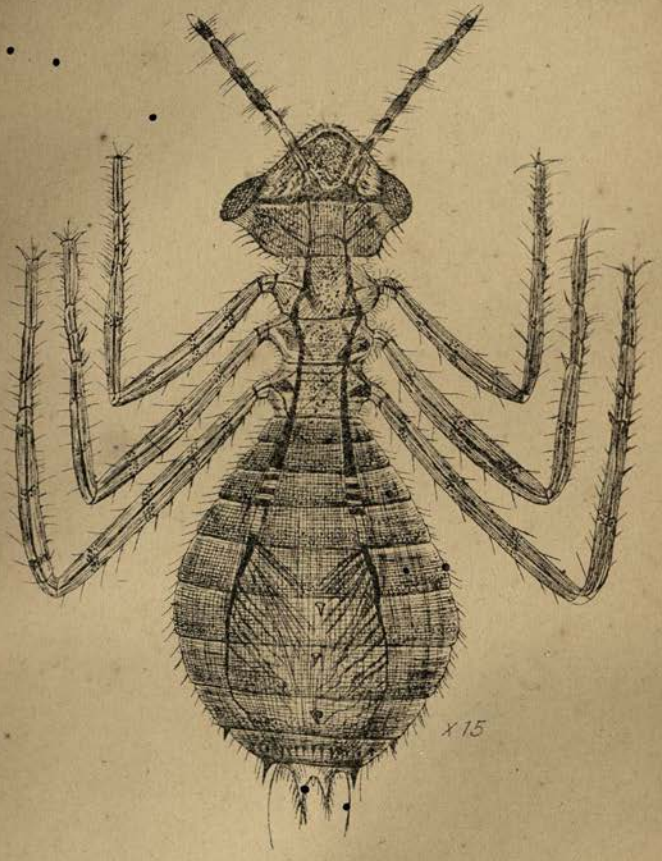
Scale — $\frac{1}{100}$ ths

× 25

J. Fleming del: ad. nat:

Frederick Dangerfield, Lith. London

Plate IV.



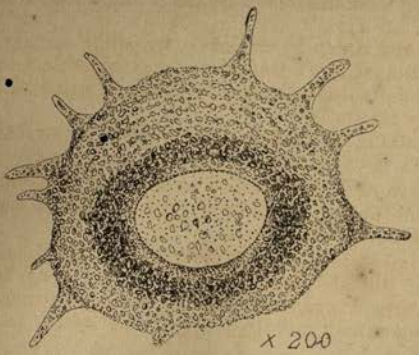
Scale — $\frac{1}{100}$ths. / x 15

J. Fleming del. ad. nat.

Frederick Dangerfield lith. London

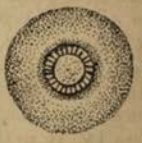
Plate V.

Fig. 1.



x 200

Fig. 2.



x 200

Fig. 4.

x 200

Fig. 3.

x 400

Fig. 5.

x 200

Scale — $\frac{1}{100}$ ths

x 200

J. Fleming del: ad: nat:

Frederick Dangerfield Lith. London

cylindrical, head snake-like, with an oral aperture beneath, and surrounded with strong cilia, and situated some distance from the anterior extremity.

A row of short, bifid hooked bristles is situated on one side of the body, and another longer set on the opposite side arranged in tufts. These creatures form tubes with mucous secreted from their bodies, and particles of sand and vegetable matter while propagating by transverse division.

Frequently six or eight young, the same as those figured, may be found in one tube, which when the latter contains one only, as it often does, resembles that variety shown in Fig. 8, Plate II.

Locomotion is effected in the water by a violent wriggling motion of its body, and sometimes in the sediment, or on the sides of a glass-bottle, as a point of support, by expanding and fastening the ciliated processes surrounding the vent, and thus projects its body forwards.

The ciliated œsophagus, stomach, intestines, and liver apparatus were readily seen.

Fig. 2, Plate III., is the larva of an insect allied to the May flies, but differs from the British species in the absence of setæ on the abdominal segments, and the extreme narrowness of the latter.

Plate IV. is probably a hemipterous larva differing from the genus Notonecta in the great breadth of the abdomen, &c. There are four tubercles occupying the site of the future wings, and three strong conspicuous spines pointed backwards on the upper and middle parts of the ninth, tenth, and eleventh abdominal segments. Plate IV

Both of these larval forms of insects were very voracious, and many specimens lived in a bottle of well water amongst water-plants for upwards of two months, and underwent no change during that period, with the exception of the surface markings becoming more distinct and pigmented. There is much doubt about the nature and species to which the latter form belongs, and possibly its general description and anatomy may form the subject of a Zoological paper on some future occasion.

Fig. 1, Plate V. is a difflugia extremely common. Plate V.

Fig. 2 is the under surface of the shell of arcella vulgaris (a living specimen is represented in Plate I., Fig. 11).

Fig. 3 and 4 are specimens of the genus difflugia pyriformis. Fig. 5 is undetermined.

The forms represented in Plates IV. and V. are common in the wells of the town of Cape Coast Castle, but rare in those of Aboom and Katakraba in the neighbourhood.

The examination of this water was done hurriedly, as opportunity offered, and in addition to other duties, and was made at the instance of the Principal Medical Officer of the Ashantee Expedition with a view to trace in connection with *post-mortem* appearances, or symptoms during life, to what extent dysentery endemic there was owing to the quality of the well water, or forms of life that the latter may have contained. It was also suggested that many cases of that disease on the coast were caused by parasites; but, with the single exception of a large ascaris lumbricoides, vomited by a dysenteric patient of the 2nd West India Regiment, no parasites were detected at any of the various *post-mortem* examinations made during the Expedition.

The cases of dysentery that ended fatally were of an acute character, and ran a rapid course from the commencement to the termination, and were associated, as the *post-mortem* examinations revealed, with a highly distended gall bladder. No careful microscopical examination of the blood, the secretions or excretions, of such patients were unfortunately practicable, and it is therefore impossible to say to what extent, if any, the disease may have been, owing to microscopic forms of animal or vegetable life, though it is quite within the bounds of possibility that many cases of dysentery and fever on the Coast, both in children and adults, may be owing to parasites of various kinds. I attribute some cases of dysentery and diarrhœa that came under my observation at Cape Coast Castle to bad food, especially an inferior quality of preserved meats and soups, while, on the contrary, the occurrence of other cases were quite inexplicable.

APPENDIX No. III

ANALYSIS OF SURFACE SOIL FROM CAPE COAST CASTLE.

By CHARLES J. H. WARDEN, F.C.S., Candidate for the Indian Medical Service.

This specimen of surface soil was brought to England by Dr. G. Fleming, A.M.D. It was obtained from Connor's Hill, Cape Coast Castle. The surface-soil was about 8 inches in thickness, and rested on a subsoil of a dark red colour, like that of burnt bricks. The vegetation was luxuriant. The water obtained from wells in the neighbourhood was very impure.

Mechanical Analysis.

Stones	1·9000
Gravel (coarse)	25·5000
Gravel (fine) } Sand (coarse) }	39·4000
Soil (fine) } Sand (fine) }	33·0980
Salts soluble in water	·1020
	100·0000

The specific gravity of the soil was 2·5.

It was readily friable, and a few particles of mica were found interspersed amongst the powder.

Water easily permeated it, and it was capable of holding 10 per cent. of H_2O. There was nothing peculiar about the colour or the smell.

Qualitative Analysis.

Soluble in water.	Soluble in HCl.	Residue insoluble in HCl.
$CaSO_4$	Fe_2O_3 (FeO trace)	Fe_2O_3
NaCl	(MnO_2 trace), Al_2O_3	Al_2O_3
Organic matter.	MgO, CaO, SiO_2	SiO_2
(trace.)	SO_3, (P_2O_5, CO_2 traces)	

A portion of the soil mixed with distilled water gave a very faint acid reaction with litmus-paper.

A small quantity of the earth mixed with a solution of caustic-soda and then heated, indicated the presence of a trace of NH_3; it was, however, difficult to ascertain whether this was due to the decomposition of nitrogenous organic matter, or resulted from the action of NaHO on some ammonium compound present in the soil.

Quantitative Analysis.

100 parts of the soil contained :—

Ferric oxide (Fe_2O_3)	3·2789
Aluminic oxide (Al_2O_3)	8·9427
Magnesic oxide (MgO)	·0643
Calcic oxide (CaO)	·7035
Silicic anhydride (SiO_2)	80·9039
Sulphuric anhydride (SO_3)	·1103
Water	·9755
Organic matter	4·4401
	99·4192

All the iron was estimated as Fe_2O_3, though a small quantity existed in the soil as FeO. The organic matter contained ·0881 per cent. of nitrogen.

The above analysis fails to show why the soil should produce the so-called "malarious emanations." It is stated in Dr. Parkes' work on "Hygiene," that "ferric oxide may assist in the oxidation of vegetable matter in an iron soil." But the quantity of Fe_2O_3 in the sample of soil analyzed appears to be present in too small an amount to be capable of oxidizing much organic matter. The subsoil, however, which, as before stated, is of a dark red colour, probably contains a larger quantity of Fe_2O_3, and therefore may have greater oxidizing powers. But as the quantity of organic matter present in the surface-soil is small and, moreover, is but slightly soluble in water, it is difficult to understand how the organic matter can come into contact with the supposed oxidizing agent.

APPENDIX No. IV.

REMARKS UPON MALARIOUS FEVERS, AND CHOLERA, &c.

By Dr. MUNRO, C.B., Deputy Surgeon-General.

WITHIN the last few years, viz., between 1867 and 1873, two books have been published, one by Dr. Oldham of the Bengal Medical Service, entitled "What is Malaria?" the other by Surgeon-Major Dr. Smith, of the British Medical Service, on *The Similarity or Identity of Malarious Fevers, amongst which Cholera, Remittent Fever, Intermittent and Yellow Fevers are described as phases, of one and the same Disease.*

The former book I have read, but the latter I have not seen, and have only learned something of Dr. Smith's views through a critique in one of the Indian newspapers.

The following remarks are not made by me now, nor do I introduce the subject, with a view to detract in the least from priority of publication, of their opinions by these gentlemen, or even priority of thought; but to explain that in 1862 in my Report on epidemic cholera in the 93rd Highlanders (of which regiment I was surgeon) I stated similar opinions, viz.: "*That I did "not believe in the existence of malarious poison, but that I was convinced that "fevers called malarious depended upon causes produced by rapid alterations "of temperature, acting upon the sympathetic nervous system,* and that from "these causes fevers called malarious resulted; and that according to the "degree of the influence of these causes, a mild or severe form or degree of "fever followed, to which degree of fever we gave a distinct name; but "which different degrees of fever were, in my opinion, *simply phases of one "disease or fever.*"

I further stated that having seen all forms of malarious fever, both in the West and East, and also having seen much of cholera and heat apoplexy, I was lead to believe, in consequence of the great similarity of these so-called different diseases, in the circumstances under which they appeared, in their symptoms, stages, treatment, and post-mortem appearances that, they were all to be considered the same disease, and each only a phase of one great form of disease.

These opinions *expressed* in my report already alluded to, but never published, are very similar, if not exactly similar, to the opinions already published by Drs. Oldham and Smith.

The first part of my Report of 1862 was published in the Blue Book of 1862; but my opinions on malaria, and the identity of malarious fevers which formed the last part of my Report were not published; but I have still a copy of the Report, and now quote that portion of it, which refers to the subject of malarious fevers and their identity.

"In my description of the valley of Peshawur, I stated that the position "of the valley surrounded by lofty mountains, that the great amount of water "flowing through and stagnating in it, that the absence of all permanent "vegetation, and the constant rotation of annual crops, all tended to produce "what is called malarious disease; and further stated that, three different "types of fever were endemic, and frequently became epidemic in the valley, "viz., the remittent, intermittent, and congestive; there is also a form which is "called ardent, but which, I think, should be styled continued or ephemeral

fever. This last prevails in the early part of the hot season; the others "later. The usual rotation therefore is, first, the continued ardent or ephemeral "fever in April, May, and even June; next the remittent and congestive "remittent in July, August, and September; and, lastly, the intermittent in "October, November, and even December.

"Such was the routine, as far as fever was concerned, during the year "1862; and, as far as I can ascertain, the same routine prevails every year, "though sometimes to a greater or less degree, according to the season; and "also according to the class of men composing the garrison, whether new "comers or men who have been in the valley more than one or two years.

"During the prevalence of remittent and congestive fever, viz., July, "August, and September; but especially July and August; cases of heat "apoplexy are of frequent occurrence, and this is the time of year in which "*cholera* prevails also.

"In April, May, and June the temperature is at its highest range; there "is little moisture on the surface of the ground consequently little or no "evaporation; and, therefore, the temperature between day and night is "nearly equal. Fevers, at this season of the year, are of the continued or "ardent type, and of short duration.

"In July, August, and September heavy rain falls and the ground "becomes saturated. The heat by day, however, ranges just as high as "during the previous months, and causes rapid and great evaporation from "the surface, which, remaining in the atmosphere, lowers the temperature, "the moment the heat of the sun is withdrawn, thus causing rapid and great "alterations of temperature.

"Systems weakened by the constant and great heat of April, May, and 'June feel these sudden changes, are more liable to suffer, and have less 'power not only to resist, but to throw off disease; consequently the fevers "which had been prevalent during the dry months, when the temperature "was equable, become of a more prolonged and grave character, and we have "then the *remittent* and *congestive fevers, heat apoplexy, and cholera.*

"Later in the season again October, November, December, though there "is as much if not more moisture in the air, the sun's heat is less, and the "difference in temperature between day and night is not only less in degree, "the power of the sun being so much less than in the preceding months, but "the system feels the difference less, and consequenty the type of disease "again changes and *intermittent fever* becomes the prevailing malady.

"What I wish to explain is this, that according to the degree of rapidity "and intensity with which alternations of temperature take place, so is the "degree of intensity or severity of malarious disease.

"When there is no evaporation from the surface the temperature is "equable, when there is much moisture the changes of temperature are great "and sudden.

"It is quite possible that the thermometer may not indicate these changes, "but the human frame feels them.

"Again, I think the degrees of temperature, high or low, with moisture, "produce or are followed by corresponding classes of disease. For instance, "where intense heat and much moisture prevail, the febrile diseases are "denoted by increased vascular excitement. Thus, in tropical or hot climates "ardent, remittent, and intermittent fevers are the prevalent types; while in "cold climates, where the temperature is low with much moisture,* typhoid "and typhus fevers prevail; yellow fever seems to be peculiar to inter-"tropical regions, while cholera invades all climates. All are supposed to "depend on some malarious or mephitic influence, but these malarious or "mephitic influences have never yet been discovered, and we only guess at "their existence by effects produced; might not the same effects be produced "by other agencies?

"The forms of fever prevalent in the Peshawur Valley are 1st, the con-"tinued, or ardent, or ephemeral; 2nd, the remittent; 3rd, the congestive

* Typhoid enteric fever I do not include under this remark.

" (remittent); and 4th, the intermittent; but none of these require special " description, except the congestive remittent.

" This form of fever is ushered in generally by diarrhœa, often by vomit- " ing, and either may be followed by *collapse*, accompanied by cramps of the " extremities, succeeded by reaction and fever, which is accompanied by " cerebral disturbance; the case may terminate in convalescence, or in conges- " tion of brain, lungs, liver, &c.

" The diarrhœa is bilious, so also is the vomiting, the collapse is sometimes " extreme even to insensibility.

" There never is suppression of urine, and after fever has set in the bowels " become constipated; convalescence is always protracted.

" The different stages of this form of fever may be classed as follows:— " 1st, diarrhœa or vomiting; 2nd, collapse; 3rd, fever; 4th, convalescence or " congestion.

" Diarrhœa, vomiting, and collapse, are not always all present, or do not " always follow each other, but two of three are almost always present. Head " symptoms are present in every case in greater or less degree, but do not as " a rule run into insensibility, though cases do occur in which the head " symptoms are of the most marked and grave character.

" Convalescence is always protracted, as already stated. At first (and " medical officers who have seen it for the first time do make the mistake) this " form of fever may be mistaken for *cholera*, and I now purposely make men- " tion of it to show the *similarity between the two diseases.*

" The differences are, the absence of serous vomiting and purging, and the " permanency of the secretion of urine in the congestive remittent fever, while " the contrary is the case in cholera.

" In heat apoplexy (which is prevalent during the same season, and often at " the same time as congestive remittent fever), the symptoms are insensibility, " often, nay, generally, preceded by premonitory symptoms of intense head- " ache and frequent micturition, hot pungent skin, quick, small, wiry pulse, " violent convulsive motions of extremities, heaving of chest, vomiting, and " involuntary evacuations.

" Death may take place in this stage, or consciousness may return, followed " by reactionary fever, which may terminate in convalescence, or in conges- " tion of the brain, and death. All these symptoms follow each other in " regular succession, and are divisible into stages.

" Simple remittent and intermittent have their stages too, following each " other in regular succession.

" Cholera also is divisible into stages—1st, the premonitory stage of diar- " rhœa; 2nd, its stage of collapse; 3rd, of reaction; and 4th, of convalescence, " or of congestion.

" In comparing, therefore, the symptoms and stages of these different " kinds of fever heat apoplexy and cholera, there appears a wonderful " similarity in the order in which they occur, or in their stages, and finally, in " their terminations.

" The mode of treatment in all is very similar, and the *post mortem* " appearances, particularly with reference to the *brain* and *spinal chord*, are " almost identical in congestive fever, heat apoplexy, and cholera.

" Yellow fever, also, I have seen, and do not consider it a distinct form of " fever. Its advent is generally preceded by remittent fever, which, as the " season advances and heat becomes greater, merges into a continued fever " (the pestilential yellow fever), and as the intensity of the epidemic subsides " with the season, we find that it assumes the remittent, and finally, at its " close, the intermittent type.

" Yellow fever has its different stage, like other fevers already mentioned, " and like cholera; and so similar to those fevers and to cholera are they, that " I cannot but think *cholera* and *yellow fever one disease*, and that both are " febrile diseases, attaining to a great degree of intensity so as to become " pestilential epidemics, from local causes chiefly atmospheric.

" Wherever febrile diseases (said to be of malarious origin) occur, cholera is found also. In cold climates, and especially in cities where typhoid* and

* Typhoid enteric fever not included in this remark.

" typhus fever lurk, so there also cholera sweeps off its victims. Within the " tropics, and especially in the West Indies, Southern States of America, &c., " where the dreaded yellow fever so often rages with destructive fury, so also " does cholera; and if these two pestilences do not occur at the same time in " any particular part of these tropical regions, they have followed so closely " that the periods of decline and invasion, respectively, are scarcely per- " ceptible.

" If in the same localities, during the same season, amongst the same class " of men, almost under similar circumstances, several so-called different " diseases as remittent, intermittent, congestive remittent fevers, heat " apoplexy, cholera, and yellow fever, are prevalent: and if there is in all a " similarity in the symptoms, order of symptoms or stages, progress, treat- " ment, and terminations; and finally, if the *post mortem* appearances are in " many points (and these the chief points) similar, may we not suppose that " such diseases are originated by the same agency, and that if not all the " *same*, they are at least *phases* of the same disease, and may we not, therefore, " class heat apoplexy and cholera amongst these febrile diseases.

" It has been my lot to see all these different forms of fever and disease in " different parts of the world, and I cannot but think that the *primary agencies* " in all are heat (or different degrees of temperature) combined with different " degrees of moisture; and that all are *one and the same disease*, and that " *different degrees* of intensity of the *same* disease have been mistaken for " *different* diseases and called by *different* names.

" On page 270 will be found a table showing the prominent symptoms of " such (so called) different diseases, classified in stages. To me there seems " to be not only a great similarity in the symptoms of all, but a close analogy " between these stages, and the order in which these stages occur *in all.*

" How heat, or different degrees of heat and moisture act, so as to produce " disease, I do not know. Whether by the production of malaria poisonous " to human life, or by direct influence on the nervous system.

" It is quite as difficult, however, to comprehend what this hitherto undis- " covered malarious poison is, and how it acts, as to explain the action of heat, " or the alternating degrees of heat, long continued or sudden, on the human " system; but it appears to me just as probable that different classes of disease " may be originated by different states of atmospheric temperature, of which " we are sensible and have distinct proof, as that diseases of different kinds " may be caused by the operation of certain malarious poisons of which we are " not sensible, and of which there is no direct proof.

" How many kinds of malaria are there? Can there be one for every " form of fever or pestilence; or is there but one, which, acting in different " ways, according to local or accidental circumstances on different habits and " constitutions, produces the same effect with greater or less intensity, which " intensity is considered a *distinct disease.*

" There are different races of men, and yet all are anatomically the same, " but men differ from each other physically, morally, and intellectually; " no two men can bear pain, fatigue, or disease, or joy or sorrow alike, and no " two men are intellectually equal.

" What therefore is true of individual men is true of races, and if such be " the case may it not equally be the case that *one disease* acting on such " differently constituted individuals or races, presents a difference in the " arrangement of symptoms, to which we give the name of *different diseases.*

" What is true of individuals or races, may also be true with regard to " localities, viz., that the same disease is so modified by different local cir- " cumstances as to lead us to suppose it a distinct disease; and so also with " regard to seasons or states of atmospheric temperature.

" If during intense but equable heat we have simple ephemeral and remittent " fevers; and if again during intense heat, followed suddenly by a lower " temperature, in consequence of the air being loaded with moisture, fevers of " a more grave and prolonged or pestilential character, as congestive, remittent, " and cholera prevail, and if, during a lower temperature with much moisture, " we have intermittent fever, may it not be possible that these diseases, in- " stead of being caused by malarious poison breathed by the lungs, are attri-

" butable to the influence of these different degrees of temperature, acting on " the system and particularly the sympathetic nervous system.

" If there be malarious poisons producing disease, why is it that man alone " of the mammalia is subject to remittent, intermittent, choleraic, and typhoid " fevers? The lower animals have the same organs, breathe the same air, " consume the same products of the earth, and are more exposed to malarious " influence than man, and yet resist the influence of those unseen poisons so " fatal to mankind.

" On the other hand, animals are less sensible of differences of temperature " than man, because more exposed to them, and because nature provides them " with the means of resisting the influence of alternations of temperature, and " therefore if disease is caused by degrees and changes of temperature, they " resist them better than man who is left to exercise his own ingenuity to " guard against them.

" Besides, we find that races born in the most malarious regions resist " malaria completely; while a race introduced suddenly into such malarious " regions, from other parts of the world, succumbs at once.

" Degrees of temperature may act in the following ways:—1st, heat pre- " dominating over cold by over-stimulation of the nervous system producing " fevers in which the circulation is quickened; cold predominating over heat " by depressing the nervous power producing fevers of a low type."

My object in these remarks made twelve years ago, was to explain, 1st, that the existence of malaria as a morbific agent was more than doubtful. 2nd, that fevers called malarious were induced by the influence of rapid changes of temperature the consequence of heat or cold and moisture acting on each other, this influence affecting the sympathetic nervous system. 3rd, that remittent, intermittent, yellow fever, cholera, and heat apoplexy were only *phases of one great disease.*

Since I wrote the Report from which these remarks are taken, I have never ceased to think of this subject, and for several years, indeed for the last six years, I have been of opinion, *openly expressed to many medical officers,* that degrees of influence of temperature on moisture, though not the *direct* agents in causing fever, are the agents which produce changes in the electrical state of the air, which are in reality the *one direct* agent in causing fever called malarious; and that this electrical disturbance exercises a direct influence on the sympathetic nervous system; causing a condition of paralysis of that system, more or less sudden and intense, and to this degree of intensity of paralysis follow the symptoms to which we give different names; but which in reality are merely *degrees* or *phases* of one great disease; and that the diseases hitherto called remittent, intermittent, congestive remittent, jungle, and yellow fevers, cholera, and heat apoplexy *are the degrees or phases* of this one great disease.

The very last remark made in my report I find, was that I did not consider these diseases or any one degree or phase of this one great disease communicable by human contact.

I shall now endeavour to give reasons for my belief in the identity of diseases called malarious, and that they are caused under the influence of certain electrical conditions, excited most probably by the action of heat and moisture upon each other.

1st. The following table will show that the similarity of the symptoms, stages, and terminations of remittent, intermittent, congestive remittent, yellow fevers, cholera, and heat apoplexy is great, so great as fairly to induce the belief that they are all the *same disease.*

TABLE.

Intermittent Fever.	1. Premonitory stage of headache, languor nausea, and often vomiting. 2. Cold or shivering stage. 3. Hot stage, or fever. 4. Sweating stage or temporary convalescence. 5. Congestion of spleen, &c.

and from that date cholera disappeared, but was followed by severe cases of congestive remittent fever, which was very shortly after followed by prevalence of intermittent fever.

In this instance, the electrical equilibrium was restored by means of the violent thunder and dust storm, and fever in its most intense form ceased at once and was followed by milder forms.

I have remarked repeatedly, that in seasons of outbreaks of cholera there has been at the commencement of the season a prevalence of simple fever, followed, as the season advanced and temperature rose, by a more severe form of fever, which was followed by a still more severe form (epidemic cholera) when the rainy season had set in, with its violent thunderstorms and heavy rains. This visitation of cholera gradually becoming milder and presenting the character of remittent fever, as the violent thunderstorms and heavy rains ceased in frequency and violence, which was again followed by a still milder form (intermittent fever) as the electrical equilibrium was being established.

I have seen the same routine of fever in the West Indies (Bermuda) in 1853–54, except that yellow fever was the form in which the severity of the visitation manifested itself.

But if fever called malarious is caused by electrical disturbance, why are not all persons exposed at the same time and place to these electrical disturbances, attacked by the same form of fever? The answers are simple:—1st. All persons are not equally susceptible to the same degrees of electrical influence. Before a thunderstorm many persons suffer from headache, while others are not sensible of any change in the electrical state of the air at all.

Some few persons suffer from nervous agitation amounting to fear during a thunderstorm, while the great majority of mankind have no fear.

Persons differ as to their capability of enduring galvanic shocks and electro-magnetic currents. The slightest shock and the most moderate current of electro-magnetism being unbearable to many, while some (few, indeed) can submit to severe shocks and to long-sustained and powerful currents of electro-magnetism.

So in the operation of electrical changes and disturbances in nature in producing the condition in the human body called (malarious) *fever;* some are extremely susceptible, many less so, and the majority still less so.

But if malarious fever is attributable to the direct agency of electrical disturbance or influence, how is it that severe epidemic outbreaks are (A), not of more frequent occurrence; (B), not more universal in the extent over which they prevail; and (C), why do they spread over extensive tracts, passing certain localities in their course, and often following direct routes, occasionally diverging from these direct routes?

In reply I remark (A), The electrical disturbances or influences, although sufficient to cause the milder forms of fever (which are always more or less prevalent) are not sufficient to cause the most severe forms; (B), Great electrical disturbances are never *universal* in extent; thunder and dust storms are always local, and so great electrical disturbances are local, and severe epidemic fevers are also local, and of more constant occurrence and of more severe type, according to the frequency and prevalence of electrical disturbances. Hence in countries where we have extremes of heat and moisture, we have constant and great electrical disturbances; and the most severe and destructive forms of malarious fever (C), and the spreading of malarious fevers as epidemics over extensive districts, I attribute to electrical currents excited and kept in motion by prevailing winds and by masses of human beings travelling along different routes, affecting the electrical condition of the air along these routes, and creating fresh currents as they move along.

Believing, as I do, that intermittent, remittent, jungle fever, yellow fever, cholera, and heat apoplexy, are only degrees or phases of one great type of fever, which fever is originated by the direct agency of electrical action, causing paralysis more or less complete of the sympathetic system, I do not enter into the question, in this paper, of the many other agencies which are supposed to originate them.

I shall, in conclusion, make a few remarks upon cholera and its treatment.

Dr. Smith is of opinion that quinine is the remedy, or will be found to be the remedial agent in cholera. I am and have been of the same opinion for

years, and if I mistake not, Dr. Murray, late Inspector-General Bengal Medical Establishment, is, or was, of the same opinion also.

I have tried quinine in every form, in the stages of collapse in cholera, both by mouth and by hypodermic injection, but without success.

I believe, however, that there is a stage of cholera which has not, as far as I know, been described hitherto, the symptoms of which are as follows:—*slight giddiness, sense of constriction across epigastrium, with nausea and tingling in the feet and hands, sometimes amounting to cramp.* This I consider the first stage of cholera, and that this stage of invasion is present in almost every case; and *this* is the stage of the disease in which quinine is useful. In 1862, I recognised this stage of invasion, as will be seen from the portion of my Report published in the Blue Book of 1861; and in two subsequent epidemics I had opportunities of confirming my former observations, and I believe, nay, am convinced, that the use of quinine in *this* stage of cholera, administered both by myself and under my instructions, arrested the disease in many instances.

From what I have stated in this paper I draw the following conclusions:

1st. There is no such poison as malaria.

2nd. Degrees of heat acting upon moisture are the agents which excite certain electrical conditions, which, acting on the sympathetic nervous system, are the direct agents in causing *fever*, hitherto called malarious.

3rd. That the impression on the nervous system is a condition of paralysis of greater or less degree.

4th. That the fevers called intermittent, remittent, jungle, and yellow fever, and cholera and heat apoplexy, are the manifestations of the different degrees of paralysis; and consequently, that these so-called different diseases are merely phases of one great type of fever.

5th. That quinine is the remedy, which, if administered at the very commencement of any one of these phases of fever, is most to be relied on.

6th. That there is a stage of cholera (or the choleraic form of fever) described in this paper, which is the *first* stage, and which is almost invariably to be detected; what has hitherto been called premonitory diarrhœa being the commencement of the second or confirmed state of choleraic seizure. The first stage (as described by me) is that in which quinine is to be adminstered with every probability of success.

PLATE I.

Fig. 1.

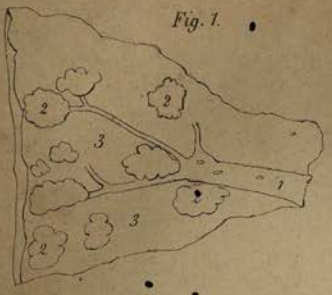


Fig. 3.

Fig. 2.

Fig. 4.

Fig. 5.

Fig. 6.

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PLATE II

Fig. 7.

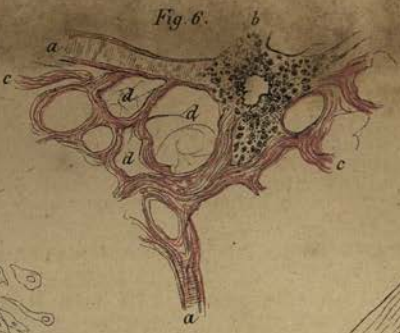


Fig. 4

Fig. 10.

Fig 9.

Fig. 2.

Fig. 8.

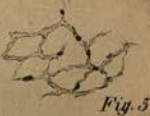
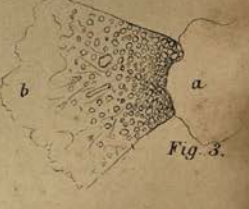
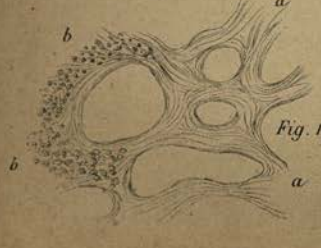
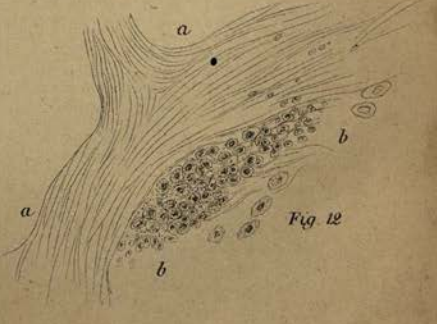


Fig. 5.







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APPENDIX No. V.

THE NATURE AND VARIETIES OF DESTRUCTIVE LUNG DISEASE INCLUDED UNDER THE TERM PULMONARY CONSUMPTION, AS SEEN AMONG SOLDIERS, AND THE HYGIENIC CONDITIONS UNDER WHICH THEY OCCUR.

By Francis H. Welch, F.R.C.S.E., Surgeon, Army Medical Department, and Assistant Professor of Pathology, Army Medical School, Netley.

The Alexander Prize Essay, December 1872.

[EXPLANATION OF PLATES.

Plate 1.

Fig. 1.—Small portion of a catarrhal phthisical lung; the section sketched natural size. (1) Small bronchus laid open to show its termini in (2) caseous lobules; (3) intervening parenchyma, slightly congested and tough, otherwise normal.

Fig. 2.—Mag. 60 diameters.—Catarrhal phthisis. (1) Air vesicles, swollen out by cell accumulation; (2) Intervesicular tissue the seat of hyperplasia; (3) Mass of cell elements turned out from the interior of a vesicle.

Fig. 3.—Mag. 500 diameters.—Epithelium-like cells in active growth, forming the intra-vesicular mass in the nodules of catarrhal phthisis, prior to caseation and softening.

Fig. 4.—Mag. 30 diameters.—Two of a group of miliary nodules occupying the pulmonary stroma; in the larger one there is a distinct nuclear differentiation which is not apparent in the smaller one. In the surrounding tissue the inter-vesicular elements were in excess of normal, and radiating in degree from the nodule circumference.

Fig. 5.—Mag. 150 diameters.—The circumference of a miliary tubercle, showing adenoid cord-like prolongations from it into the inter-vesicular tissue of the adjacent air-cells, forming a network around the air vesicle, and rendering it more or less irregular in contour; (*b*) A more highly magnified cord-like process of the adenoid tissue lying beneath the membranous wall of the air vesicle and epithelium.

Fig. 6.—Mag. 30 diameters.—A portion of omentum, stained by carmine, the site of miliary nodules. The morbidly hypertrophied adenoid elements are seen as cord-like strands, inosculating with each other and with smaller nodules, and traversing the entire tissue as a network. They are also seen as connected with the adenoid tissue of the wall of the capillary blood-vessel (*a*). The effect of the carmine staining was, to completely distinguish the colour imbibing nuclear particles of the adenoid tissue from the intervening elements.

Plate 2.

Fig. 1.—Mag. 500 diameters.—Illustrating the ultimate termination of the adenoid plexus of Fig. 6, Plate 1. On tracing the delicate lines there depicted they were seen to merge into the delicate tubes or channels delineated in Fig. 1, Plate 2; these diverging from a nucleated branched protoplasmic adenoid mass or cell (*a*), and very similar to, if not actually, the normal lymphatic network strongly pronounced under morbific influence.

Fig. 2.—Natural size.—A large crude miliary tubercle, surrounded by a fibrous capsule. Surrounding lung tissue perfectly crepitant and apparently normal.

Fig. 3.—Natural size.—Sketch of a small portion o flung tissue (*b*), adjoining a cavity (*a*) partially occupied by disintegrating caseous material. The lung tissue (*b*) is tough and fibrous, and the seat of very numerous miliary growths, which radiate in decreasing ratio from the circumference of the cavity. The fibrosis was limited to the region of the nodules, and the pulmonary tissue beyond (*b*), was crepitant and comparatively normal. There were no cell elements within the air-vesicles of this portion of the lung tissue.

Fig. 4.—Mag. 500 diameters.—Nuclear particles of miliary tubercle, acted on by acetic acid and stained.

Fig. 5.—Mag. 320 diameters.—Strongly defined stroma of miliary tubercle, from which the nuclear particles have been removed by washing.

Fig. 6.—Mag. 50 diameters.—Illustrating enlargement and tortuosity of capillaries of lung in hæmorrhagic phthisis. (*a*) Enlarged vessels giving off alveolar branches; (*b*) Inter-vesicular blood extravasation; (*c*) Varicose and contorted pulmonary plexus; (*d*) Alveoli with irregular outlines from extravasation or vascular dilation. From a portion of lung, crepitant and comparatively healthy, the remainder of the viscus having the same condition of the smaller vessels with fusiform dilatation of the larger branches, and with numerous scattered patches of crude pneumonic products, varying in size from a pin's head to a lobule, and frequently with a blood-clot as a nucleus.

Fig. 7.—Mag. 150 diameters.—A fragment of stroma in pyæmic phthisis, the tissue increased in amount, swollen, and beaded by cell forms and large nuclear particles. Blood vessel impervious from blood coagulation.

Fig. 8.—Mag. 60 diameters.—Portion of a young syphilitic lung nodule, showing the fibroid germination between the air vesicles with deep pigmentation; air vesicles gradually collapsing.

Fig. 9.—Mag. 150 diameters.—Portion of a very early node, when to the naked eye seen as a speck of glutinous material in the lung substance. Fibre-cell germination.

Fig. 10.—Mag. 500 diameters.—Elements of the nodule. Age of the particles increasing from right to left.

Fig. 11.—Mag. 150 diameters.—Miliary tubercle and fibrosis of lung; (*a*) Hypertrophied lung stroma; (*b*) Nuclear adenoid elements passing between the vesicles. Beyond (*a*) the fibrosis merges into normal lung stroma.

Fig. 12.—Mag. 500 diameters.—The same as Fig. 11, only more highly magnified to show the complete boundary between (*a*) fibrous tissue elements, and (*b*) miliary tubercle nuclear particles.]

Preface.

Lung destruction is the great devastator of all military communities; it is also a very important factor in the mortality of the civil records, hence each segment of the community is strongly interested in the enquiry into the nature of the disease and the causations, for upon the accurate elucidation of these depends the question of the utility or uselessness of preventive measures; in sum, whether consumption is to continue, as heretofore, to ravage humanity unchecked, with its incalculable attendant amount of unhappiness, pain, and misery,—or whether future generations are not to seek for the details of the disease in a bygone literature, as we now do for the plague and black-death, or to come nearer to our own time, as we are beginning to do, with epidemic small-pox. No question of the day is of a primary importance to this; it concerns the politician, the political economist, the man of religion, equally with the custodians of the body health—each individual is interested in it, as bound the one to the other by the common bond of humanity.

That the mind of the English medical world is far from a state of concord on the nature of the consumptive lesions of the lungs is clearly indicated by the late discussion at the Pathological Society of London, "On the Anatomical Relation of Pulmonary Phthisis to Tubercle" (March 18th, 1873), originated by Dr. Wilson Fox, the question still centred in the connexion of the normal adenoid tissue with the miliary tubercle and consequent lung destruction, but modified by the strongly expressed opinion of this morbid condition of the adenoid tissue being more frequently met with as an *infiltration* than as a *nodule* (the old well-recognized "miliary tubercle"), and from the constancy of the presence of this element (in abnormal quantity), as an infiltration or a nodule in the morbid anatomy of all phthisically diseased lungs, the unity in nature of consumption was inferred. By more than one observer the propriety of retaining the word "tubercle" was raised as having no common meaning, and not conveying to the minds of all the same pathological product; moreover, the impossibility of recognizing the morbidly increased adenoid tissue (miliary tubercle) by the microscope in all cases, and differentiating it "from certain growths, which resemble it, such as those of leukæmia, typhoid glanders, and even some forms of inflammation," was stated; yet, notwithstanding this, the unity of consumption from the presence of this adenoid tissue, generally as an infiltration, was apparently deduced. Some name,

however, is necessary to designate a very common morbid product, and as no substitute for the adenoid tissue, amassed as a nodule, was found which met all demands, the old word "miliary tubercle" or nodule is made use of in the pages of this thesis. In still continuing it I wish to limit it to that pathological structure, with naked eye and microscopic characters, detailed at page 321. Whatever the nature and origin of the miliary nodule may be, and whether it be similar in nature and histological elements to the so-called adenoid tissue as an infiltration, its presence would certainly appear to form the main distinguishing feature in the morbid anatomy details of one class of lung destructions; the name "miliary nodule" well expresses the naked-eye aspects of the disease product, is well known in pathological science, and, taken in conjunction with associated conditions, is not likely to be confounded with other growths or masses with which it has much resemblance in ultimate histological particles.

How far the unity of diseased action can be deduced from the mere presence of the same histological elements in partially destroyed viscera is very debatable ground, especially when unaided physical features cannot distinguish the protoplasmic masses of a cancerous tumour in an adult from those engaged in the building up of the tissues in the fœtus. Because we cannot detect any variation between the elementary constituents in the solitary intestinal glands in the so-called tubercular lesion, in typhoid fever, or in dysentery, we do not infer from that a similarity of causation and nature in all, nor in the ulceration and tissue destruction which follow with glandular mesenteric enlargement are we contented to see the same disease agency in operation; equally in the case of an open sore on the leg producing irritation in the lymphatics of the neighbourhood, we carry our enquiry beyond the mere local destruction of tissue to ascertain the nature and course of the process which has led up to it; why then should we depart from the same course, when the point of enquiry is centered in the pulmonary viscera? Because that in a disintegrating lung an excess of adenoid tissue is present with other products of disease, are we right in inferring that the abnormally increased adenoid tissue has also been present as a nodule or infiltration in the parts which are already destroyed, and that it has been of major importance in originating the destroying lesion? It would appear to be a generally received opinion among English pathologists that "the overgrowth of adenoid tissue is an inevitable result of common irritation on many kinds of tissue, and especially on the lung tissue," and that "nearly any irritation acting within the lung can produce, at greater or less distance, a local crop of miliary tubercles, attended with more or less of miscellaneous inflammatory products, resembling in all essential points the changes which, in experiments on animals, have been produced indifferently by infection with putrid matter, with tuberculous stuff, and also by the more continuous irritation occasioned by a seton inserted in the skin." In accomplished lung destruction, considering the rich lymphatic supply of the viscus, and the facile production in abnormal abundance of adenoid tissue and nodules, the wonder is—not that in the tissue left abnormally abundant adenoid elements are found, but rather that they are not more abundant than what they seem to be. But from the presence of these abnormally abundant adenoid elements in portions of lung not yet destroyed (while destruction is complete in other portions) can we fairly conclude or infer that the process leading to lung destruction began in the adenoid tissue normally existing in the portion of lung already destroyed, for this is what we want to elucidate? Few will question that long continued diseased processes tend to blend together the products of disease into a mass that it is extremely difficult, if not impossible, to unravel, no matter what the original agency happened to be. It is the histological elements involved, and the nature of the diseased agency which commenced the *original* lesion terminating in lung destruction, which is the problem to be solved—whether inflammatory or syphilitic or other growths, for it is clear that subsequent adenoid tissue development may be produced, under circumstances of irritation or infection, from either of these sources, yet not necessarily taking part in the original malady. What would be thought of the geologist who saw in every heap of stones and earth the same physical agency in their commingling, without taking into consideration the collateral evidence furnished by the method of deposition, their relation to each other, the shape of the mass, its site

and relation to the surrounding surface configuration, and yet, in the enquiry into disease, are we not pursuing such a course?

But granting that the same histological elements are present in the lungs of a case of acute tuberculosis as in the remnants of a chronic phthisis, surely the nature and phases of the rapid disease, not necessarily producing destruction, are not identical with the slow insidious lesion of the latter malady, often only inducing death by gradually cutting off the capability of respiration through extensive visceral destruction; and, even if so, where are the points of similarity between the disease which produces a general dispersion of adenoid growths in the viscera rapidly fatal, and that which induces a limited tissue destruction (I refer to the localized apical lesions, page 326) comparatively harmless to the individual at the time being, and certainly innocuous in after life! As pointed out elsewhere ("Lancet," April 26th 1873), "the adenoid element is not the "cause of the most characteristic phthisical (*i.e.* destructive) processes in the "lungs." It is not the process of commingling of ultimate products and of disintegration, but rather the process of fabrication of the morbid mass which we want to unravel, and the agencies, physiological or pathological, which operate to this end; for if we cannot elucidate these factors we may well despair of placing preventive measures on a rational basis likely to be followed by the community at large.

In the first portion of this essay it has been attempted to pourtray the varieties of lung destruction observed in the army, as exemplified in a given number of cases of consumption, spread over a period of eleven years. These cases of destructive lung disease have been arranged in groups according to the nature of the diseased product, and the phases of evolution of the lesion, and in varieties according to the differences in the early periods of their history, and the clinical and pathological phenomena which accompanied the progress of the case.

Two distinct periods characterize the history of the disease-process—consumption: (1) A period of pathological building up, commencing with the earliest departure from the healthy lung constituents, and terminating with the production of a morbid mass—inflammatory material or circumscribed growths; (2) A period of retrogression in which these morbid products either become abortive from absorption or semi-absorption leaving a cicatrix or a calcareous concretion, or form a caseous mass, or undergo disintegration with an excavation occupying the site. The linking of the inflammatory process and nodular growths with the tissues involved, the nature of the excitant, whether derived from without or originating within the economy,—these constitute the main differentiating features of the varieties of consumption, and determine the particular appellation of each. It will be observed that, in the ensuing pages, I have dwelt comparatively long upon the early history of the varieties, and entered in a cursory manner only into the clinical features of the pronounced disease—the stage generally to be found in the occupants of the hospital wards; my reasons for doing so are, that it is mainly upon the earlier history and the progressive evolution of the lesion that the differentiating features of each variety are based, the which demand every scrutiny and attention for the rational and systematized application of preventive measures fraught with so much of hope in the future; and that after the consolidation of the lobules (the point from which destruction of tissue dates), the phases of disintegration, the associated general systemic disturbance, the objective and subjective visceral symptoms, have much in common in all the varieties. Viewing phthisis in a curative and therapeutical aspect, our idea of the disease is taken from the latter standpoint—the period of passive degenerative changes, with a general community of symptoms in each variety leading to the inference of the *unity* of the malady; but it is unquestionably to the early stages, the period of activity and building up of pathological elements, leading to the consolidations regarded as phthisis pure and pronounced, that we must direct our attention to ascertain the nature of the multiple lesions amassed under the term "consumption," the causation of each, and the different hygienic requirements for the prevention and curtailment of maladies so little under the influence of medicine and therapeutical measures when merging into the stage of tissue disorganization.

The hypothesis of a prior inherited diathesis, as explanatory of the origin

of the lung destroying lesion, has been excluded in the majority of the examples as wanting in substantiating elements, while the main mass of army disease has been regarded as essentially local and dependent on external causes. It is not, however, intended to deny the potency of inherited diathesis in disease, and especially in that under consideration, it is merely stated that the *army cases* do not usually conform to such a rule. The old landmark of an inherited diathesis, as inducing the consumption, was thrown back by the acknowledged non-specificity of the adenoid nodule; the unity of the disease, however, with the all-importance of the adenoid elements, in morbid excess, is re-asserted; whence then is light to illumine our darkness on the potency and process of transmitted causes, and who is to collect the discordant elements and produce order out of present chaos? Is the inherited diathesis, so far as lung destruction is concerned, an expression merely of a textural delicacy—a vulnerability of constitution—in virtue of which the viscera are extra susceptible to any noxious or irritant agency, and may not this delicacy, primarily originating under external agencies or internal causes of tissue deterioration, be transmitted to the offspring; or, on the other hand, does it also embrace a congenital histological peculiarity, such for example as a congenital superabundance of adenoid tissue—congenitally abundant gland development—scrofulous diathesis? —which is liable to assume a morbid character and progress under slight irritants? Certainly, facts appear to favour both deductions.

It has been endeavoured to show that in *all* the forms the main phase in the accomplishment of destruction is inflammatory in nature, and that in the majority of cases this is the only diseased action present; limited to the air vesicles in the pneumonic forms, with tubal involvement and chronic hyperplasia of the fibrous skeleton of the lung in the catarrhal or bronchitic, with obstruction from occlusions of the blood vessels in the pyæmic and embolic, with circumscribed growths in the purely syphilitic and tubercular varieties—gummata and miliary nodules, the former originating probably in the cellular tissue elements, the latter probably in the lymphatic or adenoid system.

Assuming the inflammatory nature of the main mass of military lung destruction, it may be asked why so many examples of this process terminate in chronic lung disorganization, a result not common in acute or croupous pneumonia? To this it may be replied, that the frequency of phthisis (*i.e.* destruction), as a sequel of lobar or lobular inflammation and long-continued bronchial irritation, has been probably much underrated, from the assumption of a prior miliary growth, as an excitant, in the illustrating examples, and that in the army the ascribed agent of the vesicular irritation and growth of the epithelial particles is long continued and permanent in operation, producing products which are opposed to rapid disintegration and fatty liquefaction, but tend to temporary stability in accordance with chronic or sub-acute inflammatory formations elsewhere. The result of this constant irritation on the air passages is to render them unduly susceptible to external agencies, and favorable to chronicity of disease when generated. Besides these local results, the influence of foul-air inspiration is exerted on the body generally, and this, together with tropical service and its diseases, and other deteriorating agencies enumerated in the second portion of the essay, undoubtedly engender that "vulnerability of constitution" so favorable to the latency and caseation of diseased products.

That well authenticated examples of pneumonia, terminating in caseous transformations of the products, are not numerous is clear, and from this, at first sight, a point might be raised, that the mere frequency of caseous masses in consumption was sufficient, in itself, to negative the hypothesis of their inflammatory origin; yet, on the other hand, the medical mind has been so retained within one especial groove as hitherto to discern in the mere existence of a caseous mass in the lung a sufficient voucher for its origin from miliary nodules, and the development of these in an inherited diathesis. The advocates of the tubercular nature of all lung destruction admit that the *major* part of caseous masses is composed of inflammatory products, and that these latter are the more potent in tissue destruction; it becomes a further question for elucidation whether the *whole* of the mass, in many instances, may not be traced to such a process, and this, independent of all predisposition existent in the frame. That the lungs are exceptionally vulnerable to both external and internal causes will

hardly be questioned, considering the frequency with which they exemplify diseased agency as compared with the other viscera, or that this diseased agency is often of an inflammatory nature; we do not often have the opportunity of tracing the unquestionable caseous mass from the unquestionable inflammatory product, yet the possibility of the former owing such an antecedent is authenticated, and its relative frequency in the different forms of sub-acute and chronic pneumonia is a point for future elucidation. The major part of all lung inflammation has hitherto been regarded as exemplified by acute sthenic pneumonia, equally as all yellow cheesy products have been considered due to tubercular growths; but because preconceived ideas have hidden from us the intermediate links, that is no sufficient reason for negativing the connection of the lung destruction with prior inflammatory phases, and denying that which is clearly foreshadowed by recent pathological research, and a broader basis of clinical enquiry.

The stage of disintegration and excavation into cavities has been traced through a prior phase of caseation—tyrosis, a process of an intermediate character between the changes of acute inflammatory products in general and fatty degeneration, a partial drying up and shrivelling of the components by which the mass is rendered quiescent and inert for a permanency or temporary period; under the latter aspect, while breaking up, showing by the microscope numerous fat globules (not observable in the crude caseous nodule), as though the disintegration of the mass was effected by fatty softening, or by the commingling with it of liquid products of recent superadded inflammatory action in its vicinity.

The development of miliary growths has been considered due to an infective inoculation from the softening caseous mass in the tuberculo-pneumonic and bronchitic forms, and as according with the experiments upon the lower animals. The facts observed in these cases of military consumption have led to the nodules being regarded, in all but the pure tubercular phthisis, as non-essential, non-originating, but complicative, and in the cases in which these growths had acted as a prodrome they were present with, and might have been derived from chronic diseased products elsewhere than in the lungs. It seems clear that the production of the miliary tubercle in the system may ensue from caseous disintegrating elements variously originating—from inflammatory lung products, gummatous nodules or breaking up of a prior adenoid growth, purulent collections, dysenteric ulcers, disintegrations of bony textures, or products of diseased action in a stage of purulent or liquefied metamorphosis, cancer, &c.

The miliary nodule is regarded as the result of a rapid morbid germination of the nuclear or corpuscular elements of actually existing lymphatic tissue (adenoid tissue), set in operation by absorption of disintegrating morbid material similar to a bubo in a non-infecting syphilitic sore, and soon, in its turn, to degenerate.

Doubts, however, have been cast on the similarity of origin of the nodules in the lung to that occurring in artificial irritation, because that the nodules resulting from experiments in animals are by no means usually destined to a "dangerous kind of transformation, but on the contrary, tend mostly to the "harmless fibroid change, which results in the so-called encysted tubercle," and to account for this dangerous kind of transformation in man a constitutional diathesis is invoked. Yet are the factors similar? On the one hand, we have a lymphatic overgrowth ensuing on local irritation in a healthy animal, on the other, we have the same result ensuing on prolonged tissue disintegration within a viscus, in an individual necessarily impaired in health and stamina from the anterior disease process; be it remembered also, that in animals in disease, the tendency for the tubercle or caseous mass to terminate in an inert nodule unaccompanied by tissue disintegration is the rule, while the opposite holds good in man; hence we may fairly deduce that, with a similarity of origin in both, the ultimate results may be modified by accompanying circumstances peculiar to each, and that this divergence in results is insufficient to negative a community in nature and production.

On the theory of the development of the adenoid nodules in the lung by lymphatic infection from a disintegrating caseous mass a possible objection may be raised to its reception by their extra frequency in the pulmonary textures as

compared with what we know of caseous masses in other organs and viscera and subsequent spread therefrom. On the other hand, however, we are in the infancy of knowledge concerning the guiding laws of adenoid development from necrotic inoculations; but, acting on this theory, and considering the free access of air to the disintegrating elements in the lung substance, whereby it is easy to conceive the production of a more noxious irritating compound than in a caseous viscus entirely or comparatively shut off from the decomposing influence of atmospheric air, remembering also the wide extent of surface over which the irritating agency would operate both in the immediate vicinity of the breaking up mass in the lung and along the length of the pulmonary tubes rich in lymphatic supply, we might *prima facie* assume that which in fact we find exemplified in disease—the production of adenoid nodules in ratio to the extent to which the normal lymphatic elements were exposed to the noxious irritating agency.

The more the morbid anatomy of consumption is advanced, the more clear and certain becomes the deduction—that the products of disease are but pathological derivatives from the normal textures, the result of morbific influence on the histological elements of the pulmonary viscera.

The sub-acute pneumonic and catarrhal varieties of consumption are markedly chronic, the tubercular least so; the clinical features of acute phthisis are detailed in these cases as occurring with the morbid anatomy details of pure tubercular, sub-acute pneumonic, and hæmorrhagic varieties.

It is not assumed in this paper that the enumerated forms of consumption have upon any one and each given point features special to each and differentiating the one from the other by clearly defined land marks, but the statement is advanced that the combined prodromal, clinical, pathological, and anatomical details of each are sufficiently explicit and discriminative to warrant the adopted segregation, partially necessary in a therapeutical point of view, but absolutely essential for the devising of sanitative and preventive measures. The main features of each variety are set forth in the subjoined tabulation of consumption in the military community terminating the first part of the essay.

It must, however, be observed that one form of consumption may be engrafted on another, the lung exemplifying the characteristics of each—that with a previous limited tissue destruction, an exposure to the exciting agencies may be followed by an involvement of the remaining structure of lung in one or other variety according to the nature of the cause, but differing from the former disorganizing process; this, although not common, is clearly traceable in some instances.

As preliminary to the enquiry which forms the subject of the present thesis I have cast together these few cursory remarks upon lung destructions in general in order to render more lucid the position taken in the ensuing pages on those forms of disease observed in the military segment of the community. Whether, or not, the varieties of consumption decimating soldiers be similar to those current in the community at large; whether on the other hand they be exceptional and peculiar, dependent on the special circumstances dominant in army life; or whether, with an origin in common, divergencies may be produced in the course of the malady by the different external surroundings of each class; these are points far from being determined. The circumstances of military life however—the surrender of individual liberty, the range of climate of our foreign possessions, the sifting-process of recruiting, the ascertainable health history of the soldier and the surrounding life conditions, the possible clear tracing of each malady from its commencement to its termination,—these marked characteristics give a weight, to deductions derived from this class rarely obtainable from the community at large, yet no less applicable in their general bearing. The Army Medical Blue Book gives forth its yearly quotum of valuable information culled from a world-wide source, but to the profession at large it is unfortunately as though it were not, and hence its influence on Medical Science, more especially on the important preventive branch, is at a minimum.

Considering how much all preventive measures are necessarily tinged by theory, the importance of eradicating doubt (as far as possible) on the nature of the disease so powerful as a general life destroyer is evident, and more

especially in the military segment of the community, when it is remembered that, as recorded by Davy (contributions to the "Pathology of Army Diseases"), with figures mounting from 1817 to 1860,—"While the proportionate "mortality from phthisis in the United Kingdom was one-fourth of all diseases, "in the British Army at home it had exceeded one-half," and as expressive of its wide dispersion among the troops—"that out of 1,205 *post-mortems* indiscriminately taken only 461 were without tubercles or cavities," *i.e.* 61·7 per cent. exemplified lung destruction.

To render the details of the morbid anatomy of the several forms of destructive disease of the lungs more clear, and the pathology of the lesions more intelligible, it has been thought best to terminate the preface by a short *resumé* of the anatomy of the lungs and the histological elements composing their parenchyma. This is necessary for two reasons; first, that a decided position may be taken on points that have been hitherto doubtful, *e.g.*, epithelium and adenoid tissue; second, because identifications and descriptions of morbid appearances are obviously influenced by the elementary forms which are typical of pulmonary structure.

The following constituents are regarded as present in the normal texture of lung;—

(*a*) A layer of areolar tissue is observed around the large vessels and tubes at the root of the lung. This layer passes in with the sub-divisions of the vessels and meets the sub-pleural layer at the periphery of the viscus; it surrounds each lobule and isolates it from the contiguous ones; it sends off secondary strands which pass between the lobulettes or air sacs forming a distinct boundary to each, and from which an extremely delicate layer passes between the trabeculæ or air vesicles coalescing with their walls of yellow elastic tissue. This areolar layer forms the stroma, fibrous skeleton, or framework, of the viscus; it supports and combines into a whole the ultimate lung constituents—the parenchyma; it acts as a bed for the larger tubal trunks. It is involved in long continued bronchial irritation and catarrhal phthisis, is implicated in the growth of the gummatous nodule, and when hypertrophied probably forms the limiting membrane of the cavities after disintegration and elimination of the caseous material. It probably derives its nutriment from the bronchial arteries.

(*b*) The parenchyma is made up of lobules the amassing of which constitutes a lobe and the doubling or tripling of the latter the left and right viscus respectively. The lobule is a microcosm of the lung in health or disease, and contains all the observable elements. It varies in size and shape according to position; it is conoidal or pyramidal, but subject to irregularity from circumferential compression, the apex being the point of entrance or departure of the broncheole, pulmonary artery and vein branch, nerves and lymphatics, the base formed by the divergent ends of the air sacs, and especially observable through the pleura. By delicate dissection the lobule can be separated from its neighbours and studied in its entirety. It is found to be sub-divided into lobulettes or air sacs, six to ten in number, elongated and irregularly cylindrical but tapering towards the apex of the lobule; these are linearly arranged to each other, diverging from the broncheole and vessels, and are probably distinct, the alveoli of one not communicating with those contiguous to it. The lobulette is mainly composed of the expansion of the branch of the broncheole into alveolar or vesicular spaces, circularly outlined cœcal pouches around which externally the capillary pulmonary plexus is spread. A section of a lobulette under the microscope shows the alveoli or air vesicles, $\frac{1}{70}$th to $\frac{1}{300}$th of an inch in diameter, to have a clearly defined circular wall of yellow elastic tissue, coated internally by a layer of delicate polygonal epithelium* merging into that lining the broncheole, and continuous externally with the areolar tissue which is especially observable near the circumference of the lobulette as non-

* The existence of this as a normal constituent is still the subject of controversy. Whatever doubt may be cast upon it under ordinary circumstances none can remain when a portion of lung is examined which has been the seat of congestion during life: the cells become clearly defined with an arrangement as above detailed, and it is difficult to understand their presence in such examples except as histological elements.

separable from the interlobular stroma. In the meshes of the alveolar wall are the pulmonary capillary plexus and also lymphatics. Thus, from the apex of the lobule companion branches of the artery, vein, bronchus, nerve, and lymphatic diverge,—the bronchus expanding into the lobulettes and air cells around which externally the other elements are distributed; the whole are held together by areolar tissue. From the lobule the several tubal branches are traceable into the main trunks of the lobe; the lymphatics into the glands and network accompanying the tubes and vessels, and hence to those at the lung roots, especially apparent posteriorly at the division of the bronchus to the lobes, and invariably enlarged under long continued pulmonary irritation.

Introduction.

In order to obtain the fullest and clearest comprehension, during perusal, of the amassed details brought forward in the elucidation of the several component parts of the thesis, it will be advantageous at the commencement to furnish a general idea of the embraced topics and range of the inquiry by a definition in as terse language as possible of the subject chosen as the theme. The necessity for such on the present occasion is apparent with so heterogeneous a subject as pulmonary consumption, so common-place as a diseased state, such semblance in many features as to suggest an unity, so plural in association, origin, and pathology, with so much of the nature and natural history of its varieties still the subject of controversy and doubt.

To leave the definition of this very complex form of lesion in the words with which it is coupled in the heading, "destructive lung disease," thus rendering the phrases mutually convertible, would err merely on the side of comprehensiveness by embracing a structural disorganizing factor so divergent in nature as cancer; yet, by the adoption of a qualifying adjunct, a restriction can be placed to limit the range of textural derangements within the ordinary significance of the term, and which at the same time shall generally express their nature and anatomy. On this principle it may be stated that, *under "the heading of pulmonary consumption as seen among soldiers," are comprised destructive lesions brought about through lobular consolidations of more or less of the lung parenchyma, which end in disintegration of the new material and of the textures involved in the solidification with the formation of caverns;* in certain varieties the lobular consolidations are preceded by miliary or gummatous growths, and all are generally liable to be complicated by the development of the adenoid nodule during the disintegrating of the caseated diseased products.*

This anatomical basis may be supplemented by the systemic status with which the local textural lesion may be associated.

We observe the destructive lung disease (*a*), under the aspect of a visceral wasting and degradation, preceded by a prodromal inflammatory process, with clinical features substantiating it as primary and local to secondary and general derangements which may follow; (*b*) as forming one of a series of visceral involvements under a general tuberculosis; (*c*) as associated with the evolution of a specific virus—syphilis; (*d*) and occasionally as a sequel of divers diseased conditions of the frame.

In the official statistical nomenclature† phthisis pulmonalis appears in each division of classification; in the first, "General Diseases," under section B, which comprises "such disorders as are apt to invade different parts of the body simultaneously or in succession, which are sometimes spoken of as constitutional diseases, and often manifest a tendency to transmission by inheritance," here regarded as a local manifestation of a scrofulous diathesis bound up by the developmental process with the textures, and necessarily inseparable from the

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* It will be noted that this definition is borrowed mainly from Professor Aitken (*Practice of Medicine*, 6th edit., vol. ii., p. 811), and is co-equal in range with the "Phthisis" of Dr. C. T. Williams, which embraces "besides tubercle, all states of the lung which tend to excavation and caseation."—*Report, Med. Chir. Soc.*, Jan. 10th, 1871.

† "The Nomenclature of Disease," Royal College of Physicians, London, 1868.

frame, and placed on the same footing as "acute miliary tuberculosis;" in the second, "Local Diseases," which occupy special parts of the body, under the respiratory system, with the explanatory prefix of "acute pneumonic," "chronic pneumonic," and conjoined with the destructive disease of lungs peculiar to trades, such as millstone, grinders', and miners' phthisis,—here regarded as a distinct visceral lesion, inflammatory in nature.

This classification would include but little of the disease current among soldiers. The first official form would probably recognise the "pure tubercular variety" of this essay, the "local disease" form would, in certain pathological details, be in unison with the varieties of the inflammatory group, while divergent in others; no place would be given to the syphilitic and alien lung destruction. There is, however, a distinct separation in the official nomenclature in the conception of phthisis as a general, and as a regional, lesion; and it is the intention to retain in view this division in the grouping of the varieties of consumption observed among soldiers and detailed in this essay.

The heading of the theme indicates three main points of inquiry, which, for facility of working, may be arranged as under, in the form adopted in the current pages:—

Part I.
(*a*) The varieties of pulmonary consumption as seen among soldiers.
(*b*) Their nature.

Part II.
(*c*) The hygienic conditions under which they occur.

Part I.

The Varieties of Pulmonary Consumption seen among soldiers, and their nature.

In order to arrive at a conclusion upon the modifications of lung disorganization characterising the military segment of the community, and the relative prevalency of each, I have taken as a basis those instances occurring to me personally, and as many well authenticated cases as possible strewn through the pathological records or elsewhere, during the years 1860–71; in this way combining the data culled from regimental experience and restricted, with those gathered from all parts of the foreign segment of the army, and all arms of the service. I have limited the examples of the lung destruction to this period of twelve years, for the reason, that the annual Blue Books of the Army Medical Department, commencing in 1859, allow of a statistical comparison year by year, and supply more or less ample data on which to base "*the conditions under which the disease originated*;" hence the groundwork of each part of the essay is composed of materials derived from the same period, and mutually dependent.

In order to differentiate this hydra-form disease into groups and varieties, I have mainly taken a *morbid anatomy* standpoint, supplemented by clinical data, believing that the elucidation of diseased action is best accomplished by taking the relics furnished by necroscopical inquiries and educing the phases in operation for their production by an accurate dovetailing in of the clinical features of the case; the dead-house being in this respect to medicine what the earth's strata are to the geologist; the worker in one seeking out pathology, in the other cosmical evolution; lesions and fossilized forms being the respective bases on which to raise the hypothesis; the facts cannot vary although the explanation of them may, in accordance with the balance of probabilities.

In the development of this classification, I have discarded as far as possible all theoretical ideas, and, by carefully examining each individual case, varieties and groups have been formed as differentiating features became sufficiently marked and constant to warrant the separation. Hence the tabulation cannot be taken as applying to the civil, but only to the military community; nor can it be considered as exhaustive. I regard the classification as expressive of the forms of lung disease exemplified in 230 well authenticated cases

occurring among soldiers; including the main varieties, but necessarily provisional only.

The result of this segregation on the basis adopted is shown in the subjoined Table:—

Group 1.

In this group the destructive disease of the lung occurs as an essentially primary inflammatory local lesion, and in it are comprised the main forms of consumption dominant in military life. The lung lesion is regarded as disconnected with any constitutional, hereditary, or engrafted specific, defects; but originating from external causes, and in conditions of the pulmonary textures thereon ensuing—the early building-up stage being inflammatory in nature, and the lung destruction brought about by chronic ulterior changes in the products. The disease in this group may run a course ending in death with lesions entirely limited to the respiratory viscera, or may be followed by various textural derangements elsewhere in the nature of secondary complications, originating from the primary lung disorganization in divers ways.

Group 2.

In this group the destructive lung disease is observed as a visceral expression of a general agency, and the basis of construction of the class is the anthesis of the first group. A prior general feature is in existence, from which, and by which, the pulmonary lesion is evolved; an enthetic virus-syphilis, a constitutional diathesis or source of adenoid infection. The involvement of the lung tissues is through the generation of pathological growths—the gummatous and miliary nodule; the subsequent phases of the local lesion consisting in changes, mainly degenerative, limited to these growths, or in the supervention of inflammatory action and a series of consecutive processes in the combined elements of morbid production.

Group 3.

In this group the destructive lung disease occurs as an occasional sequel to other diseases of divers character. To the component varieties of this group I have given the term, "alien or engrafted phthisis," as expressing the conditions under which they originate, being foreign in nature to the diseased state with which they are conjoined individually, and engrafted on a lesion which forms the prefix to indicate in nomenclature the one from the other varieties. The lung destruction is differentiated from the former groups in these respects, it is neither idiopathic, nor dependent on a specific virus, nor has it as a rule a pathological growth as a precursor, but it is a sequel of varying diseased conditions from which it is developed, or the presence of foreign bodies, and as variable in nature in the several varieties.

At first sight, it may appear somewhat incongruous to include such lesions under the heading of pulmonary consumption, yet, inasmuch as they are examples of lung destruction, some of which, so far as the morbid anatomy of these viscera are concerned, have their counterpart in the other groups, and as they may come to be classed under this item of nomenclature by the subsidence of the orginal malady leaving the local derangement to pursue its own course, it seems only consistent with pathology and clinical facts to embrace them in this category; and their exemplification in the military segment of the community explains their presence in this essay. Some of the varieties also offer features which assist in the elucidation of the nature of the previous groups.

These groups of pulmonary consumption are divided into varieties, for example:—

Group 1.—*Inflammatory idiopathic consumption*, according to the textural site of the originating lesion, may be broken up into pneumonic and vesicular, bronchitic and tubal; the varieties of each, based on the prodrome, being as follows:—

- **Group 1**
  - **Pneumonic Vesicular.**
    - Lobar Pneumonic Phthisis .... — A sequel to lobular pneumonia, generally acute in type.
    - Lobular Pneumonic Phthisis .... — A sequel to sub-acute inflammation of the air vesicles of a tract of tissue mapped out by contiguous lobules.
    - Hæmorrhagic Phthisis .... — A sequel to inflammatory changes set up by extravasated blood in the air vesicles and smaller tubes.
  - **Bronchitic Tubal.**
    - Acute Catarrhal Phthisis .... — A sequel to acute inflammation of the smaller bronchial tubes and lobular impaction.
    - Chronic Catarrhal Phthisis .... — A sequel to chronic catarrhal pneumonia.

Intermediate between this and the succeeding group, are two forms of consumption which have characters common to both groups, while possessing others no less divergent; details similar to the first group as regards the anatomical site of the lung lesion and the course of the disorganizing process, but separated from this class as being dependent for origin on an internal agency; similar, however, in this latter feature, to the second group, while differentiated from it by the absence of special growths in the pulmonary textures.

This *inflammatory specific*, intermediate sub-group may be represented in the following scheme.—

- **Intermediate Sub-Group**
  - Syphilitic Pneumonic Phthisis — A sequel to vesicular inflammation of specific virus origin.
  - Syphilitic Bronchitic Phthisis — A sequel to tubal inflammation and lobular impaction of specific virus origin.

Group 2.—*Specific textural, secondary consumption.*—Is sub-divided according to the nature of the precursory pathological growths.—

- **Group 2.**
  - Syphilitic Gummatous Phthisis — Characterised by gummatous nodules in the fibrous skeleton of the lung.
  - Tubercular Phthisis — Characterised by adenoid nodules (*miliary tubercle*) in the sites of normal *lymphatic tissue of lung.*

Group 3.—*Alien, consequential, engrafted consumption.*—Is arranged according to the disease preceding and originating the lung destruction.

- **Group 3.**
  - Dysenteric Phthisis* .... — A sequel to chronic dysentery, the lung lesion originating in a pneumonic process or development of adenoid nodules.
  - Pyæmic Phthisis .... — A sequel to embolic transference from focus of septicæmia, the lung disorganization being inflammatory or gangrenous.
  - Embolic Phthisis .... — A sequel to capillary plugging from transference of particles from a fibrous coagulum and lung destruction through inflammation or direct death.
  - Diabetic Phthisis .... — A sequel to the general disease, the lung destruction being inflammatory and vesicular.
  - Local Phthisis† .... — Originating in the transference of contiguous inflammatory action or the presence of foreign bodies in the lung substance.

* Under this category would fall those examples ensuing on "enteric fever."

† Embracing the phthisis of trades from inspired particles.

Turning now from the consideration of the varieties of pulmonary consumption to be met with among soldiers to the relative influence of each expressed as a percentage of the 230 cases, we find that the importance of each group and variety in the production of sickness and loss in the army at large is as under:—

Group 1. Inflammatory Idiopathic Consumption.	Pneumonic	Lobar Pneumonic Phthisis.	6·00	50·34	73·81
		Lobular Pneumonic Phthisis	26·52		
		Hæmorrhagic Phthisis ..	17·82		
	Bronchitic	Acute Catarrhal Phthisis..	15·21	23·47	
		Chronic Catarrhal Phthisis.	8·26		
Intermediate Sub-Group. Inflammatory, Specific.		Syphilitic Pneumonic Phthisis		5·65	9·56
		Syphilitic Bronchitic Phthisis		3·91	
Group 2. Specific Textural.		Syphilitic Gummatous Phthisis ..		5·65	11·28
		Tubercular Phthisis		5·63	
Group 3. Alien, consequential, engrafted.		Dysenteric Phthsis		1·07	5·14
		Pyæmic Phthisis		0·43	
		Embolic Phthisis		0·43	
		Diabetic Phthisis		0·86	
		Local Phthisis		1·72	

99·79

The method I have followed throughout this part of the Essay is,—the collection under each variety of those details which are special to it—differentiating the one form of lung destruction from the other; and the consideration in one section of the features common to the large first group as a whole—clinical and anatomical details, modes of death production, secondary complications (liable to ensue in, and hence equally applicable to, the other groups) &c.; subsequently terminating with a general summary or tabulation of the described forms of pulmonary consumption.

Group 1.—*Lobar Pneumonic variety of Lung destruction.*—I commence the series with this form of consumption for the reason that it presents the least divergence from a malady not uncommon, and the etiological connection of which is generally agreed upon—lobar or croupous pneumonia; and I head this variety with a few observations on cases of acute inflammation terminating in tissue destruction which illustrate the links connecting the pneumonic phase with the chronic disorganizations designated phthisis*; the two forms of lesions being in nature similar but modified in their course by accidental individual or constitutional peculiarities.

Private B. aged 32 years, in bodily configuration a fine well developed man above the average standard with no history of syphilis or prior ill-health but somewhat intemperate, contracted an attack of lobar pneumonia implicating the whole of the right lung except the immediate apex.

On the 11th day crepitation had returned over the solidified lung, asthenic symptoms had set in with alternating perspiration and pyrexia. The expectoration consisted of semi-transparent gelatinous mucus devoid of air bubbles, interspersed with parts from a pea to a pins' head in size, stringy in outline, friable, and cheesy, of a reddish yellow colour; by the microscope the

* Dr. C. Allbutt, in the *Med. Chir. Review*, Oct. 1864, p. 456, remarks:—"Of all structures of the body the lungs are the most liable to lesion, as being the most delicate and complex. Such lesions may arise by injury from without giving rise to acute pneumonias, or by weakness from within giving rise to degenerative pneumonias. The type of the former is common pneumonia of the bases, that of the latter is an ulcerative pneumonia of the apices known as phthisis. Between the two extreme types lies a series of pneumonia, partaking more of the acute or more of the degenerative character, as congestion or structural weakness is the more efficient cause of the accession." And at p. 452, regarding phthisis pulmonalis as an ulcerative pneumonia, he observes:—"The etiology of phthisis, therefore, lies not in the tubercle but in the properties of the lung tissue, and in the processes of its construction and degeneration."

clear portions consisted of epithelial cells, large exudation cells filled with fat globules and granules, free fat globules, and irregularly outlined red corpuscles, the solid parts were composed of numerous fat globules and granules, shreds of cells, cells fatty degenerated, fatty and phosphatic crystals, broken up fragments of lung tissue. From the 11th to the 25th day, the stethoscope indicated by large crepitation, gurgling, and all but amphoric resonance, the presence of small cavities scattered over the lower two-thirds of right lung, corroborated by the sputum which substantiated the breaking up of degenerated hepatized tissue, the phases remarkably resembling phthisis. On the 25th day, the left lung gave evidence of acute changes which rapidly passed into hepatization, and death followed on the 26th.

Looking to the pulmonary viscera the examination revealed as follows:—

The upper lobe and the anterior half of the left lung were collapsed and crepitant, the posterior half of the lower lobe was congested, friable, and in a state of red hepatization.

The immediate apex of the right viscus was normal, but the remainder of the organ was completely solidified, sinking in water. On section much blood and serous fluid oozed away leaving a general mottled hue of red and grey; viscus varying much in firmness, in some spots extremely friable, in others a little inferior to normal. Scattered throughout the major part was a number of cavities varying in size from a pea to a marble, indiscriminately spread and giving the idea of being clean cut excavations from the solidified texture, the interior smooth with beaded depressions shapen like the outline of a lobule; a few however were irregular and ragged, the surrounding lung structure being of a greenish colour and approaching gangrene. Accompanying also were interspersed masses contrasting strongly with the general texture, yellowish white in colour, opaque, friable, and cheesy*, and resembling in shape and size the outline of the smooth cavities (degenerated lobules of hepatized lung). In the centre of the lower lobe was an unopened abcess, the size of a walnut; a portion of the adjacent tissue was of a dark maroon colour and evidently gangrenous, but the major part of the circumference was of a dense firm material; hanging into the cavity of the abscess from the gangrenous portion of the parietes were flocculent masses made up of fibroid cells, pus cells, exudation corpuscles and shreads of lung stroma; the remaining wall was smooth, formed by a lining membrane composed of fibrous-tissue cells which were seen to pass freely into the surrounding lung tissue giving it an excess of firmness. The bronchial glands, especially the right, were enlarged and gelatinous looking; the bronchi, beyond slight redness, were normal.

On careful microscopic examination of these lungs the lesion was mainly centred in the air vesicles. In the parts least removed from the healthy state (to the naked eye in the congested stage of pneumonia) the only abnormal appearance was an encroachment on the vesicular area by the distended capillaries and an inner lining of a layer of cells, oval or spherical in outline, from $\frac{1}{750}$ to $\frac{1}{1200}$ of an inch in size, transparent, with a distinct nucleus. In the red hepatized portions the air vesicles were completely occluded with cells, $\frac{1}{750}$ inch, with double or triple nuclei and nucleoli, the aggregation giving a beaded aspect to the lung after section and washing. In the greyish portions of consolidation these cells were undergoing fatty degeneration and breaking up, forming a creamy fluid composed of oil globules, cells, and *débris* of cell material. In the parts assuming a caseous aspect the cells were shrivelled, the oily particles being absent or but few—the tendency being to dessication rather that to liquefaction. The fibrous stroma of the lung was somewhat granular and very fragile, otherwise normal; the vessels around the gangrenous patches were impermeable from blood coagulation. The morbid process might be summed up as:—cell germination and aggregation within the vesicular area, followed by degeneration and liquefaction in some places tending towards

* "In acute pneumonia the gradual changes from red or grey hepatization, with well marked granulation of the surface of a section to cheesy infiltration, can be occasionally observed; such is met with as frequently in previously healthy individuals, and especially in those affected with long standing emphysema of the lungs, as in those who have tubercles, old cheesy deposits, or cavities in their lungs."—*Niemeyer, Syd. Soc.*, vol. xlvi, p. 6.

restoration of patency of hepatized tissue, in others by dessication and caseation, followed by a breaking up of the mass with the imprisoned tissue forming a cavity; while more active states were to be observed in the subsidence of a circumscribed patch into an abcess, or direct death in gangrene.

The exciting cause of this case of acute lobar pneumonia was exposure to prolonged cold at night during a North American winter from faulty state of the housing; many suffered from these defects, and hence probably from the variation of constitution of the individuals attacked most of the modes of termination of acute pneumonia received illustration.*

Private D., of very irregular habits, admitted with inflammation of the lower lobe of the left lung. Up to the 38th day there was complete impermeability of the solidified tissue except in the larger bronchi, no respiratory expansion. On the 63rd day, a sudden expectoration of pus took place to the extent of ʒxii, with stethoscopic evidence of commingled air and fluid in a cavity; on the two following days the amount of pus was not diminished, but was mixed with much frothy sputum; these gradually decreased as the cavity closed, the man gained in health and strength, and on the 100th day was discharged convalescent with an impervious left lower lobe doubtless the seat of a large cicatricial puckering. Three months subsequently the man was in good health and had no complaint to make, but although on examination the upper two-thirds of the left lung were in working order, the base was in exactly the same state as at discharge from hospital.

The course through which such a disorganized lung passes is depicted in the following case:—

Private C. D., age 38, and debilitated by tropical service and disease, was admitted into hospital with an indistinct set of symptoms which were supposed by him due to "his old enemy—the liver," but the stethoscope revealed a consolidation of the lower half of the right lung. The consolidation did not pass off, but after a period of constant dyspnœa was followed by a sudden spitting up of a very large quantity of pus streaked with blood and of a very offensive odour. In two months from this date all pus discharge had ceased, he had improved sufficiently in health to return to duty, the lower half of the right lung being however impervious. In three months he was readmitted with a fresh copious ejection of purulent matter from the lung over which all respiratory murmur was absent; this evacuation continued, the liver became enlarged, hectic and death by marasmus and exhaustion ensued a little over two months from the last admission.

After death the liver was observed enlarged and lardaceous, the left lung perfectly healthy, the right pleural cavity obliterated, the upper portion of the right lung was crepitant but the whole of the lower lobe was the seat of a large cavity communicating with bronchi and lined by a soft flocculent pyoid membrane with the surrounding lung tissue in a state of fibroid induration.

Private J. M., age 33, an abstainer but previously very intemperate, after severe exertion had been chilled, followed by rigors, engorgement of the right lung, and hepatization. In this instance the course of the disease was uninterruptedly downwards; evidence of breaking up of the lung tissue was forthcoming in fœtid expectoration containing shreds of fibroid tissue, and death from asphyxia and asthenia on the 8th day terminated the case.

At the *post-mortem* examination, in each apex were old puckerings from prior extinct lesions, the left lung was congested, the whole of the right was hepatized, small clean cut cavities were present in the upper portion, and the base was a complete mass of gangrene. The aorta was end-arteritic and atheromatous; the kidneys were granular.

Thus, then, in each of these four examples a destruction of lung tissue was

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* 70 cases of acute pneumonia gave three deaths, all with lung destruction by ulceration, suppuration, or gangrene. Of the 67 recoveries, one had a large purulent collection in left lung, subsequently narrated, and five others ultimately suffered after a lengthened but variable interval, from phthisical destruction of the tissue implicated supervening in the parts not restored from the original hepatization. The sputum and morbid anatomy of these cases showed that cell germination was the main agent in the occlusion of the air vesicles. For observations upon pneumonia in general based on these cases. (*Vide* "Blue Book," 1867, p. 329.)

directly produced by the induced morbid action, the disease being, from the commencement to hepatization that generally designated as "lobar pneumonia" in which "the natural course of the local productive results of inflammation of "the lung is towards removal and restoration" (Aitken); yet, in these cases however, with impaired constitutions, acute disorganizations ensued resembling in many features the chronic changes observed in "pulmonary consumption." The general connection of acute pneumonia with external causations is acknowledged, and there is a considerable unanimity of opinion on the nature of the process which ensues in the lung parenchyma; many of the minute anatomical details are equally observed in the chronic disintegrations of most phthises, and in some of the inflammatory forms composing the first group of lung destruction are the sole divergencies from the normal condition to be detected; some of the acute cases of phthisis, in clinical details equally as in local results, could with difficulty, if at all, be differentiated from the case of private B.; hence the reasons for detailing these acute pneumonias at large and their position at the head of the inquiry, tending to substantiate the inference that analogous changes are the phases of "destructive disease of the lungs" to the same end alike in the chronic ulcerations of inflammatory phthisis as in the acute lesions here depicted.

As observed on the surface of the body there is a vast range of modification in features, course, and morbid details, between the rapid changes of acute, and the gradual results of chronic inflammation, though in nature acknowledged akin; it is no less a well authenticated fact that, as regards the skin for example (the external duplicature of the mucous membranes), lesions not to be differentiated so far as the local phase is concerned, may have varying exciting causes—specific or otherwise; it is assumed that the same pathological law holds good of the pulmonary textures, and that, taking the same standard of comparison, the minor divergences between the acute and chronic changes in the respiratory viscera, the varying exciting causes of the same process, the modifications of major details, do not militate against the statements advanced on the nature of the varieties of consumption detailed, and the all-importance of the inflammatory process.

Turning, however, from the disease, as acute, to its existence as a chronic factor of lung destruction under the garb of phthisis, the following examples are explanatory:—

Private A. B., with 18 years' service mainly in India, originally healthy, suffered from only minor ailments until the commencement of the chest affection 12 months prior to dissolution. After exposure to wet and cold he became feverish, with pain in left side, cough, and expectoration, but being on furlough at the time nothing is known of this inflammatory attack beyond the man's own statement. Following this was a period of ill-health in which he was employed at "light duty." A slight bronchitic attack ensued with expectoration of blood, and on admission into hospital there was clear evidence of consolidation of the lower lobe of the left lung with breaking up of the pulmonary tissue; the sputum contained masses of caseous material. Rapid loss of strength and flesh followed, hectic, dyspnœa, &c., with gradual advance of the disintegrating process until the sudden termination of life by profuse hæmoptysis a little over 12 months from the prodromal pneumonia.

The necropsy revealed all disease limited to the respiratory organs. The trachea was filled with clotted blood. The left pleura was coated by thick dense old films, and in places by more recent lymph, and partially distended with serum; a few old vascular adhesions passes between the lung and chest wall. The left bronchial glands were swollen, and gelatinous on section. The whole of the left lung, with the exception of its apex, was excavated into a large irregularly outlined cavity crossed by numerous trabeculæ, some of which contained pervious blood vessels, and the giving way of one of which had caused the extravasation of blood which occupied the interior of the cavity and the bronchi leading from it. There was no lining membrane, but the walls were firm, comparatively smooth, and of the same nature as the surrounding iron-grey hepatized lung substance which averaged half-an-inch in thickness. What remained of the pulmonary parenchyma was impervious to air, and opening into the cavity were the larger bronchial tubes which had undergone

disintegration which most of the blood vessels in the trabeculæ had resisted. In this instance the whole of the caseous products had been ejected.

In a second instance, fluid accumulation in the left pleura rapidly terminated life by dyspnœa and exhaustion; and on examination the base and centre of the right lung were occupied by ragged cavities whose walls were the caseous degenerated surrounding parenchyma which merged towards the lung surface into iron-grey induration; the apex was normal.

In a third example a sudden profuse discharge of blood from the nose and mouth terminated existence.

Here the major part of the right lung, and especially the lower lobe, was infiltrated with caseous products of disease; a softened patch of this was being ejected, and in the process of disintegration had laid open a pervious vessel, the source of the blood extravasation. The left lung was perfectly healthy, equally also the other viscera of body.

In this variety of destructive disease of the lung there is an invariable precursor of lobar pneumonia, clear and distinct, following the usual course of the disease to hepatization but here diverging from it. Instead of the accumulated cell elements in the air vesicles undergoing liquefaction through fatty degeneration and being removed by absorption or extrusion by expectoration there is a stability apparent, the tissue remains consolidated, the cellular intra-vesicular material shrivels and partially dries, assuming a cheese-like aspect,* subsequently this retrogresses either by the animal portion becoming absorbed leaving the earthy constituents as an inert mass of a calcareous nature to attest the prior existence of diseased products, or, as more generally happens, by breaking up through an ulcerative process, by forming excavations and presenting all the objective and subjective symptoms of lung disorganization with pyrexia and atrophy of the body framework. The bond of connection between this variety of phthisis and such examples of croupous pneumonia terminating in caseous degeneration, cavities, abscess, as previously narrated, is clear and palpable, the only differentiating feature being the period embraced; in the latter phase, the destruction being acute and immediately following the hepatization—merging by an uninterrupted process; in the former, a varying interval of latency and quiescence intervening†. Why, in the phthisis example, the cell elements of inflammatory action should remain temporarily dormant instead of rapidly liquefying as in resolving pneumonia, is not so apparent. Sometimes there is associated a prior delicacy of constitution as a possible explanation, in others there is, in spite of a large well developed frame a general want of stamina from excesses, especially alcoholic; in some again it is impossible to find any rational explanation. We cannot advance beyond the recording of the fact. Judging from some 90 carefully recorded cases of croupous, pneumonia, all occurring in soldiers, the majority of the sufferers in prior fair health and strength, I am led to believe that these remnants of consolidation are much more common than usually supposed; a point previously remarked upon by Addison.‡

Equally involved in doubt is the determining cause of the breaking up of the mass; also the time and occasion of the disintegration, and the point at which the disease shall cease to be classed as inflammatory and pneumonic, but shall henceforth be recognized as consumption. In the words of Addison—"That "degree of vital influence which holds the molecules of these deposits in a solid "state is so inconsiderable that it is liable to be impaired or destroyed by very "slight disturbing or devitalizing causes. The most common and most

* "Instead of the material of consolidation in pneumonia being liquified and reabsorbed, it becomes more dense, and finally is transformed into a cheese-like substance, which finally breaks up into a cavity. Such a termination is rare in cases of common acute pneumonia in a healthy person. It is more frequently met with in catarrhal pneumonia, and in the chronic catarrhal pneumonia to find it is almost the rule."—*Aitken, Prin. and Practice of Medicine*, vol. ii., p. 815.

† "Cheesy infiltration, from whatever cause, does not immediately lead to the disintegration and formation of cavities; by pressure on the alveoli surrounding and the blood vessels, degeneration is caused, and death; if rapid, it is termed galloping consumption."—*Niemeyer.*

‡ Vol. xxxvi., *New Sydenham Soc.*, p. 40.

"powerful of these are, unquestionably, inflammation set up in the surrounding "parts, and a cachectic state of the body, but more especially these two causes "occurring in the same individual." * The engrafting of bronchitis is clearly a cause, but it is no less clear that in others there is no discernible clue to explain the occurrence.

The process by which the consolidated patch is converted into a cavern is analogous to the phases of inflammatory action observable on the body surface, *i.e.* either necrotic in the form of a slough (rare), liquefaction into a purulent collection, abscess (not uncommon), or gradual disintegration by ulceration commencing in the centre of the mass (usual); in the latter lesion the gradual extension of the cavity by the breaking away of the cheesy degenerated surrounding lung tissue† finds its counterpart in the irregular excavated depression of a strumous and carious cancellated bone.

Features standing very prominently forward in the clinical history of this form of lung destruction are:—(*a*) limitation of the disease, generally involving but one viscus and that generally at the base; (*b*) the frequency of hæmoptysis during disintegration (from the large extent of texture uniformly embraced and consequent large size of the vessels involved the rapid course of the disease is at variance with the firm occlusion of the large ones); (*c*) the frequency with which vitality of the body is violently stopped by sudden profuse hæmorrhage from the rupture of a vessel in the wall of a cavity or in one of the traversing trabeculæ under slight, or even no, exertion at all.

The morbid anatomy details of this variety of pulmonary destruction are mainly limited to the lungs, the other organs and tissues as a rule presenting no abnormal deviations. How far these features are due to the frequent curtailment of life in this form so as not to offer the necessary time for the secondary production of the lesions observed in the other varieties of inflammatory phthisis is doubtful, yet very suggestive as explanatory, inasmuch as the cases ending in dissolution by gradual exhaustion and hectic present the same (though perhaps less frequent) complications as the other varieties, viz:—miliary tubercle production and its diffusion to other viscera, ulceration of the intestinal glands, textural degenerations, &c., the considerations of which are left for the section comprising the features common to this whole class of lesions. Contiguous to the portion of diseased lung indications of old inflammatory action in the overlying pleura in the form of thickenings and adhesions are rarely absent. The condition in which the lung substance is found on section is dependent on the extent of the original pneumonia and the stage reached in the disintegration of its products. The cavities or cavity may be observed in one of the following aspects:—(*a*) dry in the interior, lined by a distinct smooth membrane which is clearly to be differentiated from the surrounding parenchyma; (*b*) a smooth tough interior identical in nature with the adjacent lung tissue which is impervious to air, greyish, and composed of much fibroid induration, the excavation giving the idea as formed by a mere clean removal of the prior embraced material; (*c*) extremely irregular in outline and containing muco-purulent fluid, with walls of soft floculent matter and attached cheesy particles, the surrounding parenchyma being in a state of cheesy infiltration; the two former invariably of old date and indicating complete expulsion of the degenerated textures, the latter associated with the enlargement of the cloaca until the whole caseous material be disintegrated. The cavity is not uncommonly single, always large, and often crossed by trabeculæ; we must recognize also the frequent limitation to one viscus and the preponderance in size and frequency at the base. The tendency of the lesion is to advance gradually in the cavern formation until the whole of the degenerated texture is expelled, involving one lobe in its entirety or even the whole viscus.‡ It is in those cases of interrupted progress, through hæmoptysis or pleuritic accumulation of serum, that we can observe the intermediate stage of the cavern formation with the crude caseous material disintegrating; otherwise the disease as a rule is not fatal prior to the complete elimination; and hence as the total

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* Vol. xxxvi., *New Sydenham Soc.*, p. 35.

† The commencement of this disintegration is well seen in preparation, R. 705, W. 645, of the Netley Museum.

‡ *Vide* Preparation, 665 R., 609 W., of the Netley Museum.

degenerated mass is the invariable product of one involvement we can observe under these conditions not the phases of the process but merely the results, no vestige of pneumonic or tubercular deposit being present but simply the fibroid induration limiting the cavern. Provided the complication of miliary tubercle has not ensued there are no elements of diseased action present in the lungs in this variety, perceptible to the naked eye or only by the microscope, which cannot be ranged under the pneumonic process and which are not equally observable in lesions acknowledged non-tubercular; these as they are not special to this form but common to others also will meet with notice in a subsequent portion of the essay at the termination of the inflammatory group.

In this variety of lung destruction, originating in a prodromal inflammation with a causation accidental in nature, having no connection with the years of service or age, but liable to ensue at every period of life and condition, the natural tendency of the disease certainly appears to be—to lapse into a state of quiescence after expulsion of the disintegrating products not incompatible with life and fair health and strength, the cavity not wholly contracting as a rule but remaining dry in the interior with firm smooth walls. As far as nature can effect, she does,—the degenerated dead elements are removed and a firm limiting tissue shuts off the cloaca from the surrounding parenchyma; the extent of involved viscus and the constitutional powers of the individual subsequently determine the result. The majority of the fatal cases are unquestionably brought about by accidental circumstances during the progress of the breaking up of the caseous hepatized tissue—hæmoptysis, pleuritic effusion; but should this phase be successfully passed through it is astonishing to observe the extent of curtailment of breathing membrane with which life is compatible. Addison remarks—"this form of phthisis may, I think, in some instances be at least "strongly suspected if not positively declared before death, whilst not a few I "believe completely recover to die of some other disorder."*

We may sum up the differentiating features of this form of destructive lung disease as:—(*a*) a prior history of acute lobar pneumonia followed by an incomplete or unattempted resolution of the inflamed lung tissue, accompanied by ill-health with delicacy of the chest and abnormal susceptibility to external causes of irritation; (*b*) after a variable interval a development of phthisical symptoms, the objective ones limited to the tract of lung the seat of the prodrome and ulterior destruction; (*c*) the visceral position of the disintegrating part—essentially limited, generally occupying the base†, with no discernible lesion in the other lung; (*d*) the frequency with which death ensues from sudden profuse hæmoptysis; (*e*) the *post-mortem* data—general limitation of all destruction to one viscus and there localized, diseased texture uniform, indicating one age, and showing no gradations from being the result of *one* pneumonic attack, extreme size of the caverns produced, and comparative uniformity of the internal surface with traversing trabeculæ.

Lobular pneumonic variety of lung destruction.

Under this heading is comprised one of the two main forms of phthisis ravaging the military segment of the community and dependent upon the conditions under which the component individuals are compelled to live during their period of service. The clinical history and morbid anatomy of the cases lead to the deduction that the lung destruction is brought about by sub-acute inflammatory action in a varying number of contiguous lobules of the pulmonary substance, and subsequent disintegration of the tyromatous changed products of the same, generally commencing at the apex of the viscus and gradually implicating successive portions. The disease is essentially chronic in its course, extending over a lengthened period, with not uncommonly

* "Observations on Pneumonia," vol. xxxvi., *Sydenham Soc.*, p. 36.

† Dr. W. Fox (*Reynolds' Practice of Medicine*, vol. iii., p. 673) remarks:—"In pneumonia the lower lobe is most frequently involved, but the apex involvement is much more common on the right side than the left. According to Stokes, the proportion between the base and apex varies from year to year; and it appears also to be sometimes influenced by epidemic causes, rendering the upper lobe more liable to suffer than the lower." A very good example of the destruction being centred in the apex mainly is to be found in the Netley Museum, Preparation R 661, W. 605.

a decided latency of the prodrome; but a few exceptional instances can be met with, originating under like conditions and acknowledging like causation, which exemplify an acute commencement approaching lobar in extent (probably from the intensity of the exciting cause) and these tend to blend this series with the last. The main mass, however, has clinical details and modifications of the morbid process which raise it into a distinct variety of diseased action, in unison, as far as the ultimate textural components are concerned, with the previous variety, hence the ingredients are the same in both but moulded into different forms by different agencies and under varying conditions.*

Taking type-forms of this variety we observe that its earliest phase is presented to us clinically under two aspects; (*a*) pourtraying the symptoms of a limited district of engorged lung passing on to hepatization and latency, and affecting the apex†; (*b*) exemplifying a portion of solidified apex disease breaking up and being expelled.

In regimental practice, among the men reporting themselves sick with cough and chest complaints, one or other of these aspects of the disease (not as a rule included in the nomenclature as consumption‡) is far from being

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* As far as is known, the products of vesicular pneumonia in their histological details are very similar under every agency of the disease, but the arrangement of these in viscus site varies. When dependent on climatic causes, the base is the chosen site, and the involvement uniform. When dependent on internal agencies, specific poisons, &c., the arrangement is scattered, and diversified as to locality of intensity. When from the inspiration of irritating vapours, or with capillary bronchitis, the lesion is also scattered, but tends to coalesce at the apex; and this latter seems the especial feature of foul air disease. If we allow lung disorganization to be a not uncommon sequence of pneumonic products caseating, then the importance of differentiating the causations and sites of vesicular or lobular inflammation becomes of great prominence; on the point of prevention all-paramount, for it is clearly the prodrome of the phthisis that we must here regard. There can be no doubt that under the term "pneumonia" an inflammatory lesion is embraced extremely diversified in causation, with well-defined laws of evolution as to site and tissue involved, and until these are thoroughly elucidated it seems only rational to conclude that the foundation of the sequel (phthisis) is wanting in certain supports of etiology and pathology.

† This form, in its localized prodromal pneumonia, approaches that described by Dr. Albutt, p. 613, *Medical Times and Gazette*, 1871. He mentions it "as a "class of phthisical cases omitted in the explanation of Niemeyer; they are, in the "onset at least, non-tubercular, and on the other hand they are no extension of "catarrh. They commence with consolidation of the upper lobe of both lungs, and "the rather sudden declaration of marked phthisis, with local mischief." Dr. Albutt linked his cases with mental influences, causing him to regard the disease as a necrosis. In the nature of the local lesion the military form coincides with that of Dr. Albutt, in causation and in the gradual implication of one zone after another by distinct attacks it deviates.

‡ No small amount of early and "unpronounced disease" finds a refuge under the heading "Bronchitis." A man is admitted into hospital with a very suspicious state of one or both apices, the stethoscope and sputum features suggest hepatization, or even breaking up, which may or may not be decided and confirmed by the microscope. He is entered as bronchitis *to be on the right side*. Should the lung expel or absorb the cheesy nodule, as many unquestionably do and recover, the man is returned to duty, *the result being considered a clear proof that the disease was not phthisis*. Should the case turn out unfavourably, a change in nomenclature is necessary, *the disease being now confirmed*. That this is the routine of the service few will, I think, deny, nor are the reasons for it obscure. There is the necessity of getting rid of all phthisical cases by invaliding, but for this purpose the disease must be advanced; an antipathy against a man who has once figured under phthisis being returned to the ranks; there is the doubt cast by the Medical Officer himself upon his own previous diagnosis when the case does well, the idea of phthisis as necessarily progressive and irremediable being all but a dogma of medical science, and wide spread in influence. For these reasons the statistics do not express the actual numerical frequency of "lung destruction" in the service; and that these statements are facts,—the frequency of limited disease unrecognised during life as phthisis,

uncommon, and when careful collation of the evidence furnished by the stethoscope, microscope, and ulterior results, is adopted, with exclusion of all theoretical ideas as to what a case of phthisis ought to reveal, it is placed beyond all reach of doubt that such examples must be included in the category of lung destructions; and the subsequent history of these individuals too often indicates this early attack as the first of a series terminating in disorganization of the whole pulmonary texture and death.

The two aspects, clinically distinct, into which I have divided the early phase of this variety, are but different periods of the one process, according as we meet with the prodrome or its products.

The first is clinically presented to us as follows:—The main symptoms complained of are cough and expectoration with possible slight catch in the inspiration, chest pain, and more or less *malaise*. The objective symptoms are localized, invariably in the upper part of the viscus, and generally bi-lateral; the stethoscope reveals minute crepitation, bronchophony, vocal fremitus, deficient expansion; the sputum is viscid, transparent, devoid of air, rusty coloured, with occasional pure blood, gives a reaction with the chloride test, contains abundant cell forms—in all respects not to be differentiated from the expectoration of the hepatizing stage of croupous pneumonia.

These cases soon recover so far as the general symptoms and uneasy chest sensations are concerned, but the consolidated lung patch remains *in statu quo*. The man returns to the same conditions of life under which the lesion commenced, but reappears after a varying interval, and now with distinct evidence of the breaking up of the lung tissue prior involved—cough, opaque sputum containing fat globules, disintegrating cell-elements, fragments of caseous material enclosing particles of the elastic lung stroma; the stethoscope reveals condensations with moist sounds progressing with the advance of the process of disorganization. This latter constitutes the second aspect of the disease which often is the first clinically observed from the anterior active stage not producing such an amount of constitutional disturbance or inconvenience as to compel the individual to seek relief—it is regarded as "only a cold."

That these localized pneumonias are constant under the same associated conditions as the confirmed consumption cases I am firmly persuaded, and they can be traced to merge into ulterior lung disintegration, being in fact the originator of the caseous mass; sometimes they constitute the lesion for which application at hospital is made; sometimes they can be recalled to remembrance by the individuals presenting themselves under the second aspect —that of breaking up; not uncommonly they produce so few subjective symptoms as to pass unobserved.*

Addison also, after noting the general opinion of the existence of "latent pneumonia," observes:—"an impression has thus been created, and is still "very generally prevalent, that whenever pneumonia occurs in good "constitutions and especially if the patient be young, the characteristic "symptoms enumerated ought to be present. This impression is at variance "with my own experience; and I am led to the conclusion that the simple "pneumonia of Laennec and others is not the simplest form of the complaint, "and that a truly simple pneumonia is not very unfrequently met with in

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but illustrated *post-mortem*, and of old disease in the phthisical lungs anterior in date to that noted in the medical history sheets or invaliding documents, places the matter beyond controversy.

* Not only is this apparent in these localized lesions, but even in lobar pneumonia. During an outbreak a man presented himself complaining of shortness of breath on exertion; no other symptom. His nostrils dilated on inspiration, and his eyes had a listless, exhausted appearance. Notwithstanding the absence of all other signs the lower lobe of the right lung was completely consolidated, and passed through the same subsequent phases of resolution as those with the subjective symptoms strongly delineated. This series of cases indicated that only with bronchial implications was the sputum great and dyspnœa urgent; even with a consolidated lobe the latter was not necessarily marked, and pain present only with pleural complication. In the *British Medical Journal*, 1872, p. 441, is also a case of latent pneumonia,—upper ⅓rd of right lung, terminating in complete disorganization.

"young persons and in sound constitutions unattended by either cough, "expectoration, or pain, or at least, such a degree of either as to attract "particular attention." Nor must it be lost sight of that these insidious forms of disease, these not uncommon departures from the sthenic type, doubtless often overlooked, are least likely to terminate in resolution, but, on the contrary, not unfrequently subsequently illustrate lung destruction. On this point, Dr. Powell remarks:—"another patient will be so trivally ill that he will scarce keep his room and only on careful examination is it discovered that the lower part of one lung is solidified, yet this consolidation is far less likely even to completely clear up (*i. e.* than in a 'man stricken down with acute pneumonia,') his lung may never be again sound."*

It is upon the features of the prodrome that I have based the qualifying adjunct expressive of the nature of this variety of pulmonary consumption —sub-acute pneumonic and lobular, with a causation in the inspiration of organic particles in foul vitiated air detailed in the second part of the essay. I have termed it sub-acute, inasmuch as the prodrome is clinically depicted to us as such, though probably it is only the culmination of a process the agency of which is extended over a lengthened period of operation. I regard this chronicity of action, and the assumed gradual minute pathological changes resulting therefrom, as the cause of the absence of all tendency to resolution of the products of the inflammation and the substituted latency and caseation.

Of 18 individuals, passing under my own observation, who exemplified this prior localized apical pneumonia and consecutive disorganization, the following is the sequel:—

In 2, the symptoms were very pronounced and the disintegration characterized by hæmoptysis to the extent of at least ℥vj, these were classed as phthisis,—one deserted, the other retired from the service at the expiration of his period of enlistment, six years after the attack, with no evidence of the original malady, and in perfect health and strength.

In 3, serving in the regiment after an interval of five years from the earliest attack, complete restoration had ensued; one, a lad in the band, was admitted on two successive occasions with both lungs implicated, "he had felt nothing of his chest since he came home," an interval of three years having elasped since the last attack.

In 3, recovery from the lung destruction occurred, but death subsequently from other causes,—one, aortic valve lesion, two, pneumonia. In all puckered cicatrices in the apices were observed extending from the pleural surface to a subjacent thick fibrous nodule.

In 10, after an interval, successive involvements of the viscera from the apex downwards took place, leading to what is termed confirmed phthisis. Eight of these were invalided, but in two dying, a puckered cicatrix encircling a cretaceous mass evinced the old disease in one, a small smooth cavity in the other; here no doubt being possible as to the age of these relics compared with the subsequent destruction.

Thus these apex localized lesions exhibit clinically and anatomically a lung destruction through a prior pneumonic phase; a repetition of similar involvements brings the cases clearly within the category of acknowledged phthisis; the features are identical ante and post-mortem in the limited and dispersed forms; they originate under like conditions, and are similar in their nature.

Taking as a basis cicatrices, calcareous nodules, or small cavities as exponents of prior apex disease, an inquiry spread over a large number of army necropsies and embracing "all diseases" will demonstrate how frequent is this limited lung destruction and how seldom is any record of such preserved in the Medical History Sheet, except we assume it to find refuge under the heading bronchitis. The existence also of the remains of extinct disease will be found compatible with health, strength, and good chest capacity, with no evidence of other diseased action in the lungs or like lesion in other viscera, and an absence of all symptoms of a tubercular or strumous diathesis. These landmarks of terminated active lesion are referred to by Addison† "as frequently discovered "after death without the least suspicion of their existence having been

* *Pulmonary Consumption*, p. 2.

† "Observations on Pneumonia," *Sydenham Soc.*, vol. xxxvi., pp. 37 and 38.

"previously entertained, being merely incidental and often met with in the "bodies of those who have died a violent death and who might be said to have "been previously in perfect health. The total absence of tubercles, or any other "disease whatever, in any part of either lung, goes far to negative their tubercular origin."

I have dwelt thus long on this portion of the subject because it is from the early stage of the lesion, the conditions under which it originates, and the collateral evidence furnished *post-mortem* by the accidental examples, that the most trustworthy data can be obtained for the deduction of its nature; the subsequent phases of elimination have much in common in all the varieties, and the engrafting of ulterior inflammatory action, the production of complications and secondary lesions, tend to obscure and render difficult that which was originally clear and palpable.

But it is not this limited destruction of lung parenchyma which figures in the statistical nomenclature as phthisis, and it is not an isolated patch of diseased texture which we meet with after death in the fatal cases of this variety of consumption, but a gradation of changes, diminishing in age and varying in phase from the apex downwards, leaving but little of the normal tissue, yet identical in nature; it is a combination of periodical exacerbations which has induced such defects in the respiratory apparatus and in the body generally as to render the individual frame unfit for the service or incompatible with life.

In some instances the gradual progressive involvement of the lung tissue is clear and determinable, the symptoms of the first attack being reproduced on each successive occasion as in the following example:—

Serjeant E. H., of 28 years of age and 11 of service, beyond debility consequent on long service in the Mediterranean and quickly recovered from on transfer to the depôt, gave a clear medical history sheet until the commencement of the thoracic disorder. When stationed in Ireland he was quartered with the company in a workhouse in the South West District and occupied a small room off the main dormitory of the detachment—"the requirements of the service not admitting of his being better housed." The disease commenced as "a cold "on the chest, with cough and spitting like blood, he had pains across the upper "part of the lung and symptoms which he referred to 'asthma'"; he did not go into hospital, but considered this attack to be identical with those from which he subsequently suffered. Following this was a feeling of being unwell, but the worse feature to him was the dyspnœa at night which he felt convinced was due to "the stuffiness of the room." Four months elasped, during which a transfer ensued to another station. He had married with leave, but his wife was not on the strength of the regiment and consequently not entitled to quarters; being however a well conducted man he was allowed to sleep out of barracks. His sleeping place did not give more than 500 cubic feet for self and wife. He came to hospital with marked dyspnœa and nervous exhaustion, pneumonic sputum expectoration, and evidence by stethoscope of a consolidated patch beneath each clavicle, succeeded below by a zone of recent pneumonic lesion. Quiescence ensued and he was discharged, only however to be re-admitted with another dispersion of the disease; this attack, like the former ones, originating at night and attributed by him to the "bad state of the air in the room causing him asthma" which rapidly subsided under the conditions in hospital and led to his constant application for an early discharge "to see after his family." He was taken into barracks and given some very light duty, but evidence of disintegration was not long delayed; his respiration became frequent and shallow, a deep inspiration elevating the chest-wall but with no lateral expansion; the heart's sounds were rapid but feeble; the stethoscopic signs were those of patches of consolidated tissue interspersed with others more approaching normal; there was disintegration in the upper lobes fully confirmed by the microscope, the sputum containing caseous masses with lung tissue conjoined; his health was thoroughly undermined, anæmia was markedly present with night pyrexia to an average of three degrees thermometric rise above the morning temperature which seldom deviated from the normal standard. It is not necessary to detail the sequel; suffice it, to say, that the conditions fluctuated, a period of quiescence of the thoracic symptoms would be associated with improvement in the general status, only however to be followed by disintegration in some other portion and

renewal of the hectic and body wasting; he was invalided, at which time there was a cavity in each apex and others in process of formation. The period embraced from the first attack to the date of discharge from the service, was a little more than 18 months.

The majority of the cases, however, do not exhibit this anterior stage of pulmonary engorgement and consolidation so well delineated and palpable as in the former instance; on the contrary, the engorgement and consolidation are decidedly insidious, and cause sufficient general disturbance to impress the mind of the sufferer, but yet not interfering to such a degree as to necessitate his admission into hospital. Consequently, not uncommonly, the first entry in the Medical History Sheet of such cases is that of the pronounced but limited disease. The condition in which the individual is at the time of his seeking assistance is that of disintegration of the patch already in progress. Cough has been present for some time, and morning expectoration; defective health has commenced, and the symptom complained of is, not unfrequently, blood in the sputum. The aspect of the man is that of "marasmus"; his nostrils are at work in inspiration, his lips are irregularly congested and evanescent in colour, and the quivering of his facial muscles betray a want of motor control from deficient nerve force no less expressed in the emotional excitability present. He has kept at his duty as long as he can; his weakness has been progressive; he has lost flesh and is much under his proper weight, and the history is one of "slight" chest affection, gradually increasing in intensity of subjective symptoms. On examination, the extent and degree of the mischief already accomplished are various, from the moist sounds over the disintegrating patch to the vomica in existence; and the astonishment is centred in the compatibility of so much bodily exertion with so much curtailment of breathing space and so extensive an internal surface of ulcerative action. Engorgement of the tissue surrounding the diseased portion leads to the hæmoptysis already spoken of, and intensifies the prior chest symptoms to such a degree as to prominently direct the attention of the individual to his chest as the cause of his general "falling away," and to seek relief. This engorgement, varying in amount, no less frequently soon passes off under treatment, rest, and hospital quietness.

As illustrating the varying degrees of lung-lesion already present at the first application at hospital, I append the following examples:—

Private J. N., 22 years of age and 5 of service. Consolidation over the upper fourth of each viscus, disintegration advancing in the apices.

Private J. M., age 20, service two years. He had expectorated blood to the extent of ʒxij before application. There was a cavity in the left apex with gurgling, and probably the source of the hæmoptysis; in the right apex a mass of consolidation, and coarse bronchial rales over the whole pulmonary tissue, doubtless caused by the presence of fluid blood inspired. In this instance there was a history of thoracic derangement, insidious but progressive; not, however, producing inability to perform the ordinary duties of a soldier.

Private J. B., 29 years of age and 5 of service. He was sent to hospital on account of his inability to keep up with the rest while "marching out." His own statement was that he had had a morning cough for some time, but did not think much of it. He had lost flesh, but the pressure of the pack on his chest had been the cause of his "falling out on parade." On examination, the upper lobe expansion on inspiration was very limited; there was flattening, and the rib prominences evinced much flesh and fat disappearance. The indications of a cavity in each apex, apparently about the size of a walnut, were clear and distinct.

Pursuing the clinical history of this variety of consumption, we shall find that, following the first attack, there is a distinct interval of quiescence in which with abeyance of all disintegration in the lungs marked improvement in the general health has been associated, an increase of weight has been decisive, and the man considers himself fit for duty. So far as recovery can ensue from structural disorganization of a portion of the viscus, such cases exemplify; the caseous material has been ejected, and a smooth cavern with firm limiting walls or obliteration of the same by coalescence from contraction of the fibroid tissue surroundings has resulted. Indeed, there can be no doubt that the application of the term recovery to such a result is no misnomer, as experience points out that the body-powers may be reinstated and continue uninterrupted; and morbid

anatomy demonstrates that when the expulsion of the dead caseated mass has been effected there is no tendency to extension of the cavern, but that, on the contrary, any further progress of the viscus destruction is effected by a separate involvement of the adjacent tissues passing through the same phases as the prior lesion, and that individuals dying of other causes not uncommonly illustrate localized destruction long anterior to the death-producing disease. It must, however, be acknowledged that a crippled viscus is one susceptible henceforth to minor exciting agencies, and in the service, on discharge from hospital, the man is relegated to the original conditions of military life under which the first involvement was developed. The sequel of this is, unhappily, too frequently apparent; the majority returns, after a varying interval, with a repetition of the process, and with ulterior implication of the major part of the pulmonary tissues, terminating in invaliding or death.

Too much time and space would be occupied by pourtraying the onward progress of the affection, the pyrexia and associated frame waste, the thermometric range and the correlated respiration and circulation with occasional modifications, the complications, and secondary lesions in other viscera; in these there is no special peculiarity in the variety as contrasted with the others, they have much in common in all, and are left for one conjoined description.

This variety is essentially chronic, and produces death generally by a gradual exhaustion of the bodily powers, the local changes being assisted to this end by secondary lesions, especially that of the intestinal canal.

We observe in the morbid anatomy of this variety that the lesion is invariably bilateral, though commonly more advanced in the one than the other viscus; that distinct, well-defined gradations of diseased action, expressive of distinct involvements clinically appreciable, follow each other from above downwards, giving a complete *coup d'œil* of the pathology of the lesion by reversing the order,—localized congestion and hepatization, caseation of products, softening and elimination with cavern formation, or permanency of the caseous mass by inspissation or absorption of the organic constituents, leaving a calcareous nodule. The one constant feature is "the inflammatory tubercle," caseous degenerated products of hepatization. The inconstant and fluctuating, both in frequency and site, is the miliary growth, not uncommonly absent, but when present having an invariable relation to some disentegrating or disentegrated cheesy mass, rarely associated with old latent disease, often exemplified in one viscus only. As a rule there is but little trace of diseased action in the bronchial tubes, unless an engrafted bronchitis or irritation from the passage of pus and *débris* be a later sequel. The bronchial glands at an early period, and often throughout, are enlarged, swollen, and gelatinous-looking—hyperplastic from conveyed irritation, so-called sympathetic; subsequently they may become melanotic, caseous, purulent, fibrous, cretaceous. The general texture of the lung is seen to vary in consistence, softer than normal in the parts recently diseased, in a medium state in the parts with crude material not disintegrating, extremely tough in the cicatrices or surroundings of old latent cavities. The cheesy material is found either distinctly limited, with a clear circumferential boundary, or uniformly diffused as an infiltration;* in the latter (not, however, common) the coincidence with pneumonia is more apparent to the naked eye, and may, if extensive, have much of the anatomical details of the lobar pneumonic phthisis. Under the former conditions (that generally present) we observe these masses occupying the space of a varying number of contiguous lobules, and distinctly separated from each other by intervening zones of tissue not uncommonly but little removed from normal aspect; and this feature has been adduced against the hypothesis of an inflammatory origin.† This point Dr. Addison combats; and Dr. Allbutt, after

* "If a lung in a state of tubercular infiltration is examined, its component elements are found to be the same as result from the changes that take place in the "products of inflammation; hence Virchow is of opinion that what is generally called "'infiltrated tubercle' is, in fact, with few exceptions, to be referred to an inflammatory, purulent, or catarrhal product."—"Reviewer of Hill on Pulmonary Consumption," *Med. Chir. Review*, Oct. 1861, p. 499.

† Putting out of the question the indubitable evidence furnished especially by the specific pneumonias, the lobular origin of even extensive croupous lobar pneumonia is well seen in those instances in which an opportunity is furnished of observe

remarking that "all chronic thoracic diseases have relation with phthisis, and "that lung diseases springing from internal causation are allied to degenera- "tion," observes, that "when the degenerative tendency is so intense as to "invade large parts of the lung from the beginning, as in pyæmia and large "superficial burns, then we find disease starting from the finer portions of the "lobules and progressing towards the coarser. In such pneumonias we accord- "ingly find many foci of disease separated by more healthy tissue, and such "states we call lobular pneumonia. Such pneumonias are, of course, degene- "rative, allied to phthisis."*

Again, another feature presumed to differentiate crude caseous tubercle from the products of inflammation is the site of the former at its earliest commencement in the apex of the viscus. That the chosen district of lobar pneumonia, due to climatic and external agencies is the base† cannot be questioned, but this is the form of pulmonary inflammation least frequently followed by caseation of the products, and hence least frequently the prodrome of phthisis; on the other hand, the specific and lobular pneumonias have no such disposition, while the phthisis from the inhalation of carbonaceous particles follows the same law of apex involvement as the sub-acute pneumonic, presumably acknowledging analogous causation in inspired molecular organic matter. Addison, noting "this plausible objection" of site, goes on to observe: "Without dwell- "upon the many exceptions to this rule" (*i.e.*, the limitation of ordinary pneumonia to the base), "I may, without disputing their accuracy, remark, as "a set-off against these statements, that it is quite in keeping with my own "experience, in examining the lungs of individuals who have died of diseases "not affecting the chest at all, to find indications of partial inflammation much "more frequently towards the apices than in the lower portions of the lungs. "Partial pleuritic adhesion and pneumonic changes, according to my experi- "ence, are more frequently met with in the former than in the latter situation. "If this observation be correct, will it not go some way to account for the "earlier development of tubercular disease in the apices, as a general rule?"‡ Dr. Albutt, on the same subject, mentions that "comparative anatomy demon "strates in the serpent and tortoise a higher ratio of development and com- "plexity of the apex of the lung as compared to the base, and that as we "progress upwards in the scale of organization the contrast becomes less by the "proportionate development of the base in ratio to the general organization, so "that in mammalia the distinction between apex and base is no longer evident; "but it can scarcely be supposed that a law holding good for so many stages of "the ascent is suspended for the remainder." Not only may this delicacy of the apex organization in man be inferred, and hence its extra susceptibility, but "the lung structure" in the bimana "becomes more delicate as it approaches "the trachea, and the structure of each lobule increases in coarseness from the

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ing the early stage before widely diffused consolidation has ensued. In such a case on section of the lung, at first sight the engorgement is uniform, but soon small interspersed segments are noted, of a lighter hue, and after washing out the blood these parts become more apparent, and stand at a higher level of the section than the surrounding tissue, which has become shrunken. Further more minute examination will show that those portions are more advanced towards complete hepatization, the air vesicles are occluded by morbid material to a much greater degree than elsewhere, and the inference is just,—that the inflammatory process has commenced in separated foci ultimately coalescing.

* *Med. Chir. Review*, Oct. 1864, p. 452.

† Beyond the opinion of Dr. Stokes, quoted in a former foot note, of this variety of consumption, the following is an example of a contrary nature. In one of the tri-mestrial records of the Pathological Board in the Crimea there are included 19 fatal cases of pneumonia,—in 15 unilateral, in 4 bilateral. 21 inflamed lungs gave a most unexpected fact as regards site. In 4 the upper lobe only, in 2 the upper and middle, in 6 the lower only, in 9 the whole viscus; while in these 9, in 4 the disease was more advanced in the apex, and in the remainder equally throughout. The writer remarks, "Not the least approach to tubercular disease existed, and more extended observations will be required to discover a probable cause for the peculiarity in morbid anatomy here developed." The cause probably would have been found in the exciting agency of the lesion.

‡ *Observations on Pneumonia*, p. 85.

"air-tubes to the periphery."* It is well known, also, the influence which muscular movements exert over the circulation in the prevention of stagnation, and of functional activity towards the same end. It seems certain that the chest movements are at a minimum over the upper lobes, and that the aerial bulk, compared to the pulmonary mass in the apices, is comparatively less. Moreover, the current of air, especially for expulsive purposes, is less direct in the upper than the lower lobes;† hence these parts are at a comparative disadvantage, and, bearing in mind the textural delicacy, these are the sites in which we should expect the first exponent of any process of a debilitating nature, whether derived in agency from without or emanating within the frame; and it is here indubitably that pathology demonstrates the general priority of origin in lung lesions of a degenerative character. Further inquiry into the varying causes of the different forms of pneumonia and the associated localization of the lesion is necessary before the validity of this objection of site in phthisis can be proven as groundless. The more, however, the subject is taken in hand, the more apparent become the indications that limited lung inflammations select the upper lobes; and the effect upon these parts of external constructions from accoutrements, &c., must not be lost sight of, either as potent for direct or predisposing agency, especially so far as the army is concerned.

Adverting, however, to the caseous mass, careful minute dissection will show that it is anatomically limited to certain contiguous lobules, and that the vesicular area is the limiting space of the morbid elementary constituents. Essentially characterizing this variety are the features observed by Dr. A. Clarke,‡. "In the centre it is difficult to say where the tubercular matter is "seated, it appears as if it were infiltrated. Towards the circumference, "however, the opacity is relieved by clear intersecting lines which leave "spaces between them of the size and configuration of the pulmonary air "vesicles. The clear lines correspond to the walls of the air vesicles, the "opaque masses which they enclose to their accumulated tubercular contents. "Still more externally the tubercular matter lies loosely in the air vesicles, "and may be turned out of them with a needle without injury to the walls "of the air vesicles which are seen to present their normal characters." "The "deposit is principally made up of larger cells, in the early stage of the size "of $\frac{1}{1500}$th of an inch to $\frac{1}{800}$th, with one to four oval or rounded nuclei; and "in the late stages these cells are seen only at the circumference of the "deposits where the disease is extending." "It seems, indeed, that these are "the media of production, and that the subsequent stages of the retrogressive "structural metamorphosis, as well as the metamorphosis of cells which have "not advanced to that degree of development, constitute the different structural "aspects of tubercular matter." A comparison of these details with acknowledged pneumonic products shows how impossible on anatomical grounds it is to differentiate the one from the other.

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* *Med. Chir. Review*, Oct. 1864, p. 455.

† The directness of the connection of the lower lobes with the main bronchus, as compared with the upper, is well exemplified in the following case:—A man died suddenly from the bursting of a small aortic aneurism into the left bronchus. A large quantity of blood was inhaled into the air passages and pulmonary vesicles, but in much less amount in the right lung as compared with the left. On section of the left lung the arrangement of the coagulated blood in the viscus was as under:—In the upper third, small masses were uniformly scattered, varying in size from a pin's head to a lobule, but with free crepitant tissue intervening; in the middle third, a coalescence had taken place into masses from 1 to 6 contiguous lobules in extent, while in the lower third there was an all but universal infiltration. In the right lung the apex was free, the middle third repeated the characteristics of the left apex, and the base that of the left middle third. The line of connection from the main bronchus is straight towards the base, but angular towards the apex; the air current doubtless partakes in the same characters as the blood dispersions in the above case. There would be less chance of the entanglement of small particles entering with it in the base, and hence the susceptibility of the apex to suffer first from the deposition of organic particles in foul air or from the accumulation of products formed in the smaller air tubes, and not ejected by a strong air current during expiration or coughing.

‡ *Pathological Soc. Transactions*, vol. v., p. 89, *et seq.*

Throughout the cheesy mass there is a complete impermeability of the vessels, except, perhaps, a large artery passing through it; injection of the pulmonary systemic circulation shows the structure to be completely withdrawn from the zone of vascularity,* the vitality is at a minimum, and under the least disturbing influence in the neighbourhood, or more often from no appreciable cause, the mass disintegrates and is ejected, leaving a cavern which, in this variety, has no differentiating features, except in size and arrangement from that of the former one. Occasionally, however, a more rapid process of disorganization is observed, the liquefaction of the mass into a purulent fluid abscess; this would seem to be invariably connected with, and dependent on, the engrafting of inflammatory action; condensation of the tissue surrounding with vascularity merging into comparatively normal texture are the anatomical characteristics of the encapsulated pus, which, on being opened, is rapidly ejected as though previously retained under pressure in these instances. During the process of disintegration there would appear to be an invariable irritation in the environing parenchyma, and this chronicity of hyperamia is associated with the fibroid development which is observed at a subsequent stage to assist in the formation of the parietes of the cavern or producing its actual obliterations by contraction. The smaller cavities, after complete ejection of the caseous mass, resemble in shape and size a cast of one of more lobules, the lining membrane is smooth and fibrous and can not unfrequently be traced in connection with the obliterated broncheole; the same features of cavity can be artificially produced by the careful separation of a firm caseous nodule from the surrounding parenchyma by a needle; in all these inflammatory forms of phthisis the size and outline of the cavity are in union with the anatomical details of the lung, lobular or lobar, and the inference is, that the tough fibrous skeleton modified by chronic inflammatory action forms the cavity wall, the isolating tissue of lobules in health, the limiting membrane of disorganized lobules in disease. Apparently owing to the smallness of the cavities there is a marked tendency in this variety to their contraction and obliteration, the site subsequently occupied by a fibrous mass with striæ passing into the surrounding tissue with a sinking in and puckering of the superjacent pleural surface. The extent to which this process will be carried in some examples is very marked, leading to extreme irregularity of lung surface and limited tough constrictions internally from the production of the fibroid tissue elements.† This fibroid development, however, is essentially local, found always in this variety in connection with old deposits; constricting them and radiating from them, or surrounding the cavity, their prior site. It is limited to the portions of the parenchyma in which these nodules are, and evidently is subsequent to them, not being connected with the caseous masses of more recent date, nor the prodromal localized hepatized tissue; it is a later phase, and apparently accidental in character, invariably associates with long standing disease and attempts of nature towards repair.

So far as the complication of miliary tubercle and the collateral lesions in other viscera are concerned we have here merely to note their frequency in this variety as compared with others of this group of pulmonary lesions. All are relatively more frequently met with in the sub-acute than the acute lobar form,—on the other hand, the miliary growths preponderate with the catarrhal variety, the apparent reason for which will be subsequently stated; while the intestinal ulceration and catarrh, the degenerative phases of the other viscera, are equally common.

The differentiating features of this variety of lung destruction may be summed up as follows:—

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* *Vide* "Preparations"—

R. 617 / W. 561 } human, { R. 614 / W. 558 } human, and { R. 619 / W. 563 } mecacus rhesus, by Mr. Gulliver, and { R. 602 / App. W. 23 } { R. 603 / App. W. 24 } human, by Dr. Munro, in the Netley Museum.

† Dr. Bastian, in vol. xix., *Path. Soc. Trans.*, recommends the term "fibroid substitution" for those cases of excess of fibrous tissue elements in the lung, thus stating the anatomical fact, independent of all theory of production.

(*a.*) Very insidious in its commencement, often reaching the stage of disintegration before detection; but when observed in its earliest stage presenting the clinical details of localized pneumonia terminating in latency of the products—the intra-vesicular formed elements of the prodrome caseating.

(*b.*) Very common among soldiers, and when not progressive often exemplified in the lungs of those dying of other diseases.

(*c.*) Involving each viscus, but often showing a slight advance in one over the other; commencing in the upper lobes, and gradually implicating the viscus by gradational steps of diseased action from above downwards; generally causing death by exhaustion from the extent of disintegration of tissue and colliquative diarrhœa; and essentially chronic in point of time.

(*d.*) Morbid anatomy of the pulmonary tissues substantiating the clinical features of isolated sequential diseased action, each viscus exemplifying the phases of the lesion—accomplished destruction in the upper lobes as cavities, fibroid cicatrices, dry constricted caseous nodules or cretaceous masses,—progressing disintegration of the caseous mass, and temporary crudity of others in the centre of the organ,—localized hepatization or congested patches towards the base; the products of diseased action occupying the vesicular area with no primary involvement of the bronchial tubes, and capable of being resolved into elements not to be differentiated in anatomical details or site occupied from those observed in processes acknowledged pneumonia,—the vesicular accretions in the aggregate forming a mass lobularly defined and limited to one, or a varying coalesced number of these anatomical constituents of the pulmonary viscera.

Hæmorrhagic Pneumonic Variety of Lung Destruction.

Under this heading I have collected a series of cases which have a common precursor in hæmoptysis and blood presence in the air vesicles, the nature of the induced lesion being pneumonic, and in extent and site dependent upon the degree of diffusion of the irritant throughout the respiratory tract. The connection between blood-spitting and phthisis is a point dwelt on by the older writers, Hippocrates and Galen; its frequency with the disintegrating process in the lung substance in confirmed phthisis is sufficiently apparent; but the essential feature of this variety is, that the blood, from whatever cause produced, acts as an irritant, induces pneumonic changes which end in caseation and disorganization of the portions of the tissue involved. Hence the induced lesion is similar in nature in this variety to the two prior varieties, but the agency is special; independent however of this latter feature, the phases of the morbid action in a certain number of the cases deviate so much from those prior narrated as to necessitate the differentiation of them into a distinct variety.

That hæmoptysis frequently characterises the early stage of the lung destruction in the army is shown in the relative proportion of the variety (page 287), and it becomes necessary to elucidate the connection,—whether we are to regard it as the determining cause of the subsequent disease, or as an expression only of prior structural changes; and in the latter event, whether these changes are purely tubercular—characterized by miliary growths, or on the other hand are the sequel of other diseased states or molecular deterioration of the respiratory tissues from the inspiration of deleterious particles. It is an unquestionable fact, that in these army cases there is no evidence of anterior cough or thoracic disorder, the blood-spitting is the first deviation from which ensues ultimate disorganization.* As examples I give the following:—

* Dr. Peacock, in *St. Thomas's Hospital Reports*, vol. i., p. 32, considers this as a distinct variety of phthisis. "In this form of consumption the patient is first "seized with spitting of blood, and after a variable period the symptoms of consumption supervene. The hæmorrhage may occur in persons previously in sound health, "and is then usually preceded by some more or less decided exciting cause, or by a "longer or shorter period of indisposition and declining health, and may then happen "without any obvious exciting cause." Dr. Watson also states that hæmoptysis may precede the phthisis "even by years," or "is *immediately* followed by all the signs of "the presence of tubercles." He, however, considers that in all such instances a constitutional predisposition to consumption exists.

A soldier, aged 21 years, 5 ft. 6¼ in. in height, 34 in. chest girth; no remembrance of any illness prior to enlistment; no hereditary history; habits temperate. In August 1871, while moving heavy shot, he received a blow from one of them on the left side; he felt a sensation of something giving way and immediately coughed up about one pint of blood. This blood spitting recurred a fortnight after and caused his admission into hospital. In December he had evidence of lung disorganization with hæmoptysis, and was from this time permanently incapacitated. The chest disease proved fatal 21 months after the original injury, and its cause from first to last was characterized by frequent blood spitting.

After death, exemplifying the original lesion, were numerous small cavities limited to the left upper lobe and posterior superior edge of the lower lobe, one as large as a walnut; the tissue around was tough and fibroid, and interspersed were caseous masses, some encapsulated, some breaking up and fluid. Elsewhere in the pulmonary tissue of the left lower lobe, and the right lung, were recent miliary nodules, a few lobules of gelatinous infiltration, and capilliary bronchitis. Here the connection between the old left disease and the injury is clearly shown, and the more recent miliary development is traced from the disintegrating caseous nodules. The lymphatic glands were greatly enlarged and traceable along the small tubes into the ultimate pulmonary constituents, some as small as a hempseed.

A young soldier, age 20, $1\frac{7}{12}$ year's service, 34 inches round the chest and of good general development, during a field day with the old pattern knapsack suddenly expectorated a large amount of blood, which recurred in diminished quantities for three days. This was the first departure from thorough good health. One month after, evidence of phthisis was forthcoming. The case progressed, with frequent hæmoptysis and intercurrent pneumonia, but with no evidence by stethoscope or sputum of tissue disintegration. He died on the 181st day from the first blood spitting, from asphyxia consequent on engrafted capillary bronchitis. At the *post-mortem* examination the lungs were swollen out and non-collapsed, the condition of the parenchyma was as follows:—On section, very numerous and scattered masses of white semi-caseous material, varying in size from a pin's head to a lobule, were dispersed throughout each viscus, avoiding however the extreme apex and base; none were softening but a few were irregular in shape and resembled blood extravasations. The intervening tissue was congested and crepitant, but the most marked feature which immediately attracted attention was the large calibre of the cut vessels filled with black clot,—these striking the eye similar to the bronchial dilatation in the catarrhal form of lung destructive disease. On tracing the artery from the root of the lung into the pulmonary parenchyma its branches were found to be fusiformly dilated, and near the base of the viscus one had a diameter of nearly four-tenths of an inch; the veins also seemed to partake of this condition. The mucous membrane of the broncheoles and bronchi were arterially injected and the tubes contained a little frothy mucus. With the microscope, even in those parts crepitant, the capillaries were enlarged, tortuous, and varicose, rendering the alveolar walls irregular in outline and contracting the area of the vesicle;* blood clots between the air vesicles were frequent, in fact, the capillaries, pulmonary plexus, and extravasations served to fill the whole field of vision. In numerous instances also the blood occupied the interior of the air vesicle. In those lobules, or parts of lobules, consolidated, this vascular dilatation was no less observable, and blood clot frequently formed the nucleus of the exudation, the epithelium-like cells of which the latter was composed being amassed around the aggregated blood corpuscles.

It is inferred in this case that the hæmoptysis and blood extravasations were dependent on the varicose pulmonary plexus, and that the blood clots had induced widely disseminated lobular pneumonia, the products of which were progressing towards caseation. That the vessel lesion preceded the phthisis cannot be questioned, the only doubt being the cause of the vascular dilatation. The external construction of this flexible thorax (20 years of age) by the pack and accoutrements, and the impediment to the pulmonary circulation under exertion, cannot but have assisted greatly towards it, if not directly responsible for it.

* Plate 2, Fig. 6.

The history of not a few cases of pulmonary consumpton in the army has such early details as these, extracted from the records at Netley :—

Private J. B., aged 27 years, and of 7 years' service. "Ill health dates from "an attack of hæmoptysis to the extent of ʒxx whilst bathing. Prior to this "he had had no cough or symptom of thoracic disorder; the chest symptoms "developed themselves thoroughly about a month after the original blood "loss."

Private J. S., 24 years of age, and 4½ years' service, "was seized with "hæmoptysis, which continued at intervals for several consecutive days, "shortly after it was evident that tubercular deposit was present in the lungs."

Private J. L., age 27 years. "A severe attack of hæmoptysis followed by "bronchitis, and when under treatment for this the phthisical symptoms "became developed."

Private C. W., age 27. "While on service at Malta had repeated attacks "of hæmoptysis, the last while suffering from dysentery, and soon followed by "severe lung symptoms and disorganization."

Of 97 cases of consumption occurring under my own observation, and originating in the Mediterranean, no less than 22 per cent. spat blood to the extent of at least ʒij as a minimum before indicating the slightest trace, by objective or subjective marks, of phthisis, so far as careful inquiry and stethoscopic examination could determine the point. In the majority there was no extra exertion at the time of its occurrence to link the causation, but it was remarkably frequently noted as ensuing soon after rising in the morning, and after a few minutes' tickling cough. Accompanying the blood spitting was temporary dyspnœa, and both subsided generally in rest and perfect quietude; by the stethoscope rough bronchial râles were heard over the originating patch, and not uncommonly minute crepitation probably produced in the broncheoles. Following the hæmoptysis was a period of quiescence, during which occlusion of parts of the lung could be detected by the stethoscope provided the blood accumulation was concentrated locally, but not when widely dispersed. After a varying interval lung symptoms ensued, partaking generally of a sub-acute character and merging into disintegration as a sequel, or on the other hand with all the clinical features of "galloping consumption."

Following the hæmoptysis the progress of the lesion in this variety would appear to assume a two-fold character, and apparently dependent on the amount of blood expectoration and the extent to which it would be drawn by inspiration into the bronchi and lodged in the broncheoles and air vesicles of a more or less widely diffused tract of the pulmonary substance. In one form, the majority, the amount of blood ejected by coughing averaged ʒiv; the stethoscope revealed the upper lobe as the site; evidence of consolidation in one or both upper lobes was not long delayed, and the case would progress towards local disorganization, with features hardly to be differentiated from the early forms of the sub-acute pneumonic variety with which it was linked under the conditions of occurrence similar in both. In this form termination might ensue in recovery complete and permanent, or on the other hand, the individual, relegated after discharge from hospital to the conditions accompanying the first hæmoptysis, would return with a like phase of renewal of diseased action, or undergo the same visceral disorganizations, step by step, as in the sub-acute pneumonic form with the same anatomical details of lesion. In the other form, the amount of blood ejected would be far in excess of the first, the presence of it in the large bronchial tubes sucked in on inspiration would be clear, very extensively dispersed, each clot forming a focus of inflammatory action and followed by acuteness and rapidity of symptoms analogous to acute phthisical disease.

The possibility of blood clot in the pulmonary vesicles inducing pneumonic changes and becoming the originating agency of a sequence of textural derangements terminating in phthisis has been attested by numerous observers, and is substantiated by *post-mortem* data.

Indicating the induced lesion are the following extracts:—"One of the most "common occurrences of hæmorrhage into the bronchi is inflammatory action. "The effused blood irritates the mucous membrane of the bronchi, especially "in the minute ramifications, and the morbid action often extends to the air-"cells and substance of the lungs. In all cases of hæmoptysis it is not merely

"the development or accelerated progress of tubercle which is to be dreaded, "but also the supervention of circumscribed or diffused pneumonia which may "assume either sthenic or asthenic forms."* Moxon notes "the occurrence of "hæmorrhage in the early stage of the disease, or without any disease of the "lung being present," and refers the source of it "to the bronchial mucous "membrane or the vesicles of the lung, and due to numerous causes which "disturb the circulation through the pulmonary and bronchial vessels." In his remarks in a narrated *post-mortem*, in which, from the rupture of an aneurism in the wall of an old cavity, the blood passed into the air vesicles of an hitherto healthy portion, he thus describes the effects. "The recent disease "was essentially of a pneumonic type. The quite recent pink pneumonic "patches surrounded by blood-stained areolæ were obviously due to the irritation "of blood which had been inhaled into the air vesicles, and which had become "partially decolorized and absorbed, partially commingled with inflammatory "products. The rapidity with which these processes had taken place is note-"worthy, there having been only three days' interval between the hæmoptysis "and the patient's death."† Powell states, "I have myself seen on several occa-"sions *post-mortem* examples of inhaled blood forming the nucleus of fresh "lobular pneumonia in the grey stage in cases of tolerably advanced phthisis, in "which death ensued after recent hæmoptysis."‡

Indicative of the irritant action of blood clot in the bronchi and the air vesicles in individuals dying of other disease§ than tubercular or lung destruction are the following examples:—

A case of combined fibroid and lardaceous disease of the kidney in a syphilitic subject, with hæmoptysis and lung inflammation a few days prior to dissolution, mainly from uræmic poisoning, on *post-mortem* examination revealed generally dispersed patches of hepatization of the pulmonary substance, with blood clot moulded to the air vesicles forming the nucleus of the patch. A case of extensive aortic degeneration, with lung congestion and hæmoptysis, exemplified bilateral engorgement of the base of the lungs with patches of hepatization and intense hyperæmia of the mucous membrane of the broncheoles, the air cells of the consolidated parts were occupied by the usual cell elements, but also by masses of dark pigment which were extremely frequent in the smaller bronchi and almost occluding them, the remnants of blood extravasation.

The connection between the blood clot and the caseous mass is depicted in the subjoined case of very chronic phthisis terminating fatally in the Netley Hospital; there was a long history of cough, dyspnœa, and hæmoptysis prior to the phthisical lesion for which the man was invalided. The lungs were studded with very numerous small cavities and small caseous masses, the centre of these latter was a blood mass of old date as shown by the accumulated black and yellow pigment concretions still occupying the area of the air vesicles. The lung capillaries were observed to be contorted and varicose, and the clinical details and morbid anatomy favoured the suggestion that this state of the vessels led to the blood extravasation, which ultimately became the foci of the inflammatory tubercular deposit.

The presence, however, of the originating extravasation in these cases is not always traceable, even should an opportunity of the examination of the lung

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* *Copeland on Consumption*, p. 39.

† *Path. Soc. Trans.*, vol. xxii., p. 57.

‡ *Medical Times and Gazette*, Dec. 1871, p. 675.

§ Of the presence of blood in the air vesicles and tubes forming nodular, irregular, discolorized masses, varying from a line to half an inch in extent, capable of undergoing degenerative changes themselves, or setting up active changes in the surrounding parenchyma, excellent examples are seen in "Preparations 1781, 1782, and 1783" of the Royal College of Surgeons' Museum. The case from which each was taken was one of aortic aneurism; the fibrinous masses fill individual vesicles or aggregated vesicles of a tract generally under a lobule in size, and pass into the feeding broncheoles. No ulterior changes have ensued, and the possibility of mistaking the nodules for "tubercle in a crude form" is very apparent when the unaided eye only is used and observation limited to the pulmonary organs. Still more complete and larger examples are to be seen in "Preparations $\frac{683}{625}$, $\frac{685}{627}$, $\frac{686}{628}$, App. $\frac{687}{302}$, $\frac{688}{629}$," Museum, Royal Victoria Hospital, Netley.

be offered within a few only of the onset. The inflammatory products become commingled with it and dilute it, and if much expectoration be present it is partially ejected, its main collection within the broncheoles must also favour the latter circumstance; should it, however, reach the air vesicles and remain temporarily quiescent, the intra-vesicular pigmentary deposits attest its prior existence, while its site as the centre of the caseous mass indicates its relation to the imprisoning material.

No less substantiating the irritant nature of the blood clot are the examples of hæmoptysis ensuing in the course of lung disintegration, or proceeding from the interior of a cavity. In some instances, it certainly appears to be productive of relief to the oppression and dyspnœa, and tends to produce a state of quiescence and to postpone the disorganizing process, explained by its moderate amount and by its proceeding from a congested zone around a caseous mass; while on the other hand its occurrence is often followed by a rousing into activity of acute changes over wide spread tracts of tissue, rapidly terminating in death. The explanation of these latter occurrences has been set forth by Dr. Moxon in a tabulated series of cases,* as following the rupture of a vessel in the walls of an old cavity, and not uncommonly associated with an aneurismal dilatation of the coats; these under exertion and tension from within lacerating, and either producing instantaneous death, or lighting up lobular pneumonia from the sucking in on inspiration of the fluid blood into the main bronchi and its transference to the broncheoles and air vesicles, the associated symptoms being those of acute phthisis.

The possibility of blood extravasation being the origin of pneumonic changes, caseation, and disintegration, being authenticated, and connected with the primary attack of the disease or its subsequent spread, it becomes an important question to determine if possible the cause of the laceration of the pulmonary vascular coats which allows of the transfer of the vital fluid from the normal channels to coagulate in the air spaces and there irritate. Dr. Aitken, quoting Fuller, Walshe, and others, writes, "As regards hæmoptysis of so-called idio-"pathic occurrence there is usually some latent mischief in the chest, some "local cause of pulmonary congestion, some mechanical interference with the "capillary circulation through the lungs."† The reviewer of 'Scandinavian Medical Literature' remarks, "Of earlier writers Gilibert has spoken of *varices* "*pulmonum* as the cause of hæmoptysis and phthisis. Morgagni has seen "tubercles with dilatation of the surrounding vessels. Walshe attributes "hæmorrhage in tuberculosis to molecular rupture of the capillaries of the "parenchyma, except when a vessel of more considerable size is ruptured."‡ Niemeyer refers it "to rupture of the capillaries either from over-distension or "morbid delicacy of the walls, a result of perverted nutrition."§ There is a general agreement that this hæmorrhage, the precursor or the associate of early consumption, may have its site of origin in the vessels of the smaller bronchial tubes or the capillaries of the air vesicles.

Its frequency in the army as the first element in the lung destruction process has been already noted, as well as its oft apparent origin from some tract of tissue near the apex—What are the associated conditions? That the instances in which it is met with in military life are connected with a tubercular or strumous diathesis receives no corroboration from careful inquiry into the individual himself, his antecedents, his parentage; on the contrary, it is decidedly negatived. It is equally clear that no miliary nodules or adenoid infiltration can be linked with it as cause, for in the fatal instances it is not uncommon to find these indubitably absent. It is equally certain, also, the sequence of caseous inflammatory products as a direct resultant. Yet, while opposing the explanation of the hæmoptysis in inherent constitutional defect, or prior pathological growths, the phases of its occurrence in many instances certainly indicate a delicacy of the walls of the pulmonary capillaries far removed from a normal state—a want of molecular textural cohesion which allows of rupture under causes of congestion, mechanical or functional. The structural

* *Path. Soc. Trans.*, vol. xxii.
† *Principles and Practice of Medicine*, vol. ii., p. 798.
‡ *Med. Chir. Review*, Jan. 1869, p. 27.
§ *Sydenham Trans. of Clinical Lectures.*

delicacy of the apex and the pathological tendency evinced by it to prior involvement under deteriorating influences explain the general site of origin of the outpour. That conditions capable of producing this perverted and defective nutritive phase—the cause of the tissue softening, the vascular congestion of impaired function, the mechanical congestion from chest construction, are wide-spread in the military service, is only too evident to allow of any rational doubt; they consist mainly of foul air inspiration, effects of alcoholism, and the compression of the chest walls from the tunic and accoutrements, and are entered upon in the second part of this essay.

It will thus be seen that in the majority of the army cases a prior delicacy of the capillary walls is inferred, under which, from the congestion due to the sleeping in a vitiated atmosphere, from exertion, or chest constriction, over distension and rupture ensue; and, according to the amount of blood poured out, and its dispersion in the pulmonary air vesicles, so will the case assume a sub-acute and localized character, or an acute general form. Allowing the irritative action of the blood clot and the sequelæ, no less apparent is the method in which lung destruction may ensue on valvular and other lesions of the heart, or any other cause damming back the blood current and producing pulmonary congestion and extravasation.

But before closing this heading, the calibre of the vessels calls for some remarks. The observations of Gilibert and Morgagni on the *varices pulmonum* and associated hæmoptysis, phthisis, and tubercle, are eminently suggestive of the possibility of these conditions of the walls preceding, and being the cause of, the hæmoptysis from which the lung destruction originates. An example of varicose and contorted lung capillaries having this relation to the caseous mass is detailed at p. 304, and two others I have observed in the Netly Necrological Records, to which I add also two—all apparently indicating a prior tortuosity and dilatation of the blood canals anterior to the consumption, and observed also in portions of the lung tissue free from all disease.* These instances are too few to form a basis for deduction, yet they tend to suggest this vascular lesion as a not uncommon precursor of the extravasation in the army cases of this variety, the causes of the degeneration of the wall and conditions leading to undue tension from within the vessel concurring under the present circumstances of military service. Further research however is needed, and a comparison of the capillary status of a large number of the lungs of soldiers, both those free from disintegrating changes, and also those far advanced. On the development of aneurismal dilatations subsequent to the production of the caseous mass and cavity there is no doubt; strictly they form no part of the present inquiry, which embraces only the possibility of their acting as agencies of *original* disease, yet as they are not unfrequently connected with subsequent and rapid diffusion of diseased action they cannot well be passed over in silence; they are not special to any one variety of consumption, but may follow any softening and excavated patch.

Dr. Peacock, in the paper referred to in the early part of this heading, regards hæmoptysis from rupture of an aneurismal dilatation of a pulmonary arterial branch as occurring generally when the tubercular consolidations are commencing to soften. Drs. Moxon and Ramussin† have shown the relation of the aneurism to the cavities, the vessel dilating and projecting into the cavern apparently from degeneration of its coats and absence of all supporting textures on its inner side; and have also pointed out their relation to subsequent events. An excellent example also of these ecstazias is seen in a preparation in the Museum of the Army Medical Department, Netley. The man had an attack of pneumonia, followed by the usual signs of phthisis over the left lung, and died of hæmoptysis; the left lung presented all the aspects of lobar pneumonic phthisis, with three main excavations, and in each of these was an aneurismal dilatation from a marble to a walnut in size.‡

The differentiating features of this variety of pulmonary consumption may be summed up as—

* Since writing this I have observed in two instances not only dilatation but atheroma of the larger and smaller vessels.

† Also Dr. Powell in his cases illustrating the pathology of fatal hæmoptysis in advanced phthisis.

‡ These aneurisms in cavities are much more frequent than supposed.

(*a.*) Hæmoptysis, to a decided degree, being the first clinical feature of the lung lesion;

(*b.*) Occasional stethoscopic evidence of accumulated extravasation of blood in a tract of pulmonary tissue, commonly the apex, but always in sequence to hæmoptysis,—after a varying interval, symptoms of inflammatory action, local or general, in proportion to the extent of the blood dispersion from the originating point throughout the bronchial ramifications;

(*c.*) Caseous degeneration of the products of the induced lobular hepatization;

(*d.*) Subsequent phase of the lesion in accordance with the degree and extent of the diseased action, and this in proportion to the amount and diffusion of the irritant clots;

(1.) Localized and apicial, following the same phase as the early sub-acute pneumonic variety, and showing *post-mortem* the same ulterior lesions, with the possible adjuncts of blood clot, or its fossil-pigmentary nodules, and capillary bronchial inflammation; liable also like it to destroy the viscus by a series of gradational involvements passing through the same phase as the first attack, or deviating from the first attack in the nature of the originating agency, liable to exhibit in the secondary disorganizations either the sub-acute pneumonic form, or any of the other forms of consumption in accordance with the agency in operation;

(2.) Diffused, having numerous foci of inflammatory action, with severe constitutional disturbance and great interference with the act of respiration, rapidly producing death with symptoms of acute phthisis, the *post-mortem* features being congestion of lung substance, lobular hepatization products undergoing caseation widely dispersed, capillary engorgement, with possible presence of blood clots in the vesicles or broncheoles illustrative of the agent of irritation.

From the foregoing observations, it is apparent that the majority of the army cases of this form of lung destruction are linked with the lobular pneumonic variety of consumption in the associated conditions characterizing the onset of the lesions, and hence fall into the same category for measures of prevention, while the minor proportion are regarded as dependent on chest construction from accoutrements, &c., or accidental circumstances.

Catarrhal or Bronchitic variety of Lung Destruction.

In the preceding forms of pulmonary consumption the morbid process commences in the air vesicles, with no necessary involvement of the tubes either primarily or secondarily; but, in this variety, the prodromal lesion is essentially tubal in origin, the cœcal terminations of the bronchial branches subsequently suffering by transference of diseased action. The numerical proportion of this variety (*vide* p. 287) indicates it as second in importance in composing the mass of army disease. The connection between "a neglected cough" and "ulcers of the lung" is of very ancient date and proverbial, and as apparent now as formerly, opinion being divided as to the relation, in accordance with the dual theory of the consumption,—in the one, the bronchitis originates from the presence of miliary nodules, being an exponent of the presumed pathological growths,—in the other, the inflammation of the tubes is dependent on the usual causations, the lung substance is originally normal, the bronchial lesion becomes permanent, especially in the smaller branches, it progresses backward to the lobules, which it infarcts with cellular elements, ultimately caseating; the former theory presupposes a special constitutional diathesis as a groundwork or basis of development of the adenoid nodule; the latter teaches that all are liable to the lung disorganization, provided that from varying causes the prodome be sufficiently persistent, and follow a certain course, and that the miliary growth, if present at all, is secondary only in point of time and pathological sequence. The cases composing the mass of this form of consumption in the army are reconcilable only to the last of those views.

The clinical history of these cases shows an invariable original admission

with bronchitis, succeeded by a period during which the "cough was not entirely gone," and in which there was a marked sensitiveness of the bronchial membrane to external impressions; not uncommonly a re-admission and relapse from some slight exposure, and repeated to a third or fourth time. The health however becomes undermined, the man looses flesh and strength, he suffers from night perspiration, he has dyspnœa and frequent "hollow cough," he has oppression and often slight pain in chest, he expectorates thick opaque sputum frequently streaked with blood; examination of the lungs reveals a deficient expansion, with oft flatness beneath the clavicles, there are rough râles generally in the larger tubes, and minute crepitation in the smaller in places, especially over the upper lobes and the apices; the vocal fremitus is augmented with slight bronchophomy, yet the condition is questionable; there is strong presumptive evidence, but no reliable authentic data of consolidation. The man does not improve, his general health deteriorates still further, his appetite fails, and he has pyrexia at night; the expectoration becomes purulent and more streaked with blood, not uncommonly distinct hæmoptysis;* the physical signs of consolidations of the apices or breaking up are now clear and beyond doubt; the presence of tubercles have become confirmed according to one theory, the bronchitis has degenerated into phthisis according to the other.

The bronchitis which precedes the lung consolidation† is extremely persistent, a 50 days' hospital admission being far from uncommon; the minute crepitation points out its site as the broncheoles‡ whose walls are swollen and internal coat secretes freely a very tenacious mucus extremely rich in cell forms, while the chest expansion, resonance, and vesicular murmur, indicate the air vesicles as primarily free from implication.

Dr. Clymer states "that capillary bronchitis is more common in adults than is generally admitted, and often mistaken for pneumonia or ordinary acute bronchitis."§ This inflammation of the broncheole when it extends to the alveoli produces their consolidation by the amassing in them of epithelium-like cells, and is then termed catarrhal pneumonia,‖ called also "lobular pneumonia "because it is limited to lobules, and as such it is disseminated and insulated in "contradistinction to the acute or croupous form which affects whole lobes."¶ In the examination of such a lobule, "on section, we observe a smooth, homo-"geneous appearance without the granular characteristics of acute pneumonia "and a dilated broncheole filled with tenacious secretion can be seen in the "centre"¶ of the hepatization. The subsequent stages of the merging into phthisis are mainly limited to the cell-forms occupying the air vesicles; "owing to the incompleteness of the fatty metamorphosis which takes place "in acute pneumonia the mass is left pasty and the material dry, the cells "shrivel into irregular corpuscles" (Niemeyer). In this condition "the tissue "is found filled with a number of small white masses not larger than millet "seeds; these are the vesicles of the lobules filled with exudation, and are

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* During the prodromal catarrh, and before the stethoscope can reveal consolidations, the occurrence of hæmoptysis, or very deep streaking in the army cases, is a very prominent feature and highly suggestive of an original enfeebled state of the vessel walls. A subject referred to under the hæmorrhagic variety.

† "As a protracted bronchial catarrh frequently leads to consumption it becomes "obvious that the prophylaxis of pulmonary consumption requires also measures by "which bronchial catarrhs may be prevented, and whereby even mild attacks of "bronchitis may be rapidly and completely removed."—Niemeyer, *Sydenham Translation*, p. 64.

‡ This is agreed upon by all observers, the disciples of Laennec referring it to miliary tubercle irritation, the other clique to inflammatory action set up by external agencies.

§ Quoted by Professor Aitken in *Principles and Practice of Medicine*, vol. ii., p. 734.

‖ "Sputum with fine, sharply marked, deep yellow stripes, is a sign of catarrh "of the smallest bronchi, and is very rich in cells. An intimate admixture of blood "with the slimy or muco-purulent sputa points out commencing pneumonia."—*Niemeyer.*

¶ Aitken, *Principles and Practice of Medicine*, vol. ii., p. 773.

"very likely to be called scrofulous or tubercles by the inexperienced eye" (Wilks). The coalescence of such lobules produces a mass of the so-called "yellow or crude tubercle," and the disintegration of the mass, together with the imprisoned lung tissue, produces disorganization and excavation.

That a protracted capillary bronchitis is common in the army, and that no small proportion of the "lung destruction embraced under the multiple term pulmonary consumption," has, as a precursor, an anterior stage characteristic of this lesion, will, I think, be generally allowed, no matter the theory adopted. The termination of this broncheole inflammation in tissue disorganization "is more frequently met with in weakly and delicate individuals who possess but feeble powers of resistance against injurious influences, in such a case the inflammatory products abound in cells, a peculiarity "with which the tendency to a cheesy metamorphosis of the products is most "intimately connected" (Niemeyer); yet not only the weakly, but even "*homines quadrati* are by no means secure against succumbing to an acute "catarrhal pneumonia, which, originating in a cold, terminates in a cheesy "infiltration and the destruction of lung tissue" (Niemeyer). "As a chronic disease it is a very frequent form of phthisis" (Wilks), and Niemeyer opines that it is one of the most common of diseased states, "it is a gelatinous or tubercular infiltration, and is called also, inappropriately, tubercular or cheesy pneumonia."

Although these lobular consolidations may terminate in resolution "by "completely undergoing fatty metamorphosand being absorbed, leaving the "alveoli free for air to enter" (Niemeyer), or may become quiescent by partial removal with the earthy constituents remaining as a calcareous concretion, yet, practically, possibly from the surrounding conditions of army life, the disease once commenced seldom fails to produce disorganization of tissue, and, by a succession of attacks, to involve the entire viscus and destroy life. It generally commences in the delicate apices, and is bi-lateral; a period of latency and abeyance of diseased action follows the primary destruction; the disease may stop here, as is seen in the caseous masses and calcareous concretions or cicatrices of those dying of other lesions but previously affected and cured, but the deranged bronchial tubes are very susceptible and fresh involvement is brought about by very minor degrees of exposure and general agencies. This and the sub-acute pneumonic variety are the two dominant forms of pulmonary consumption in the army, equally chronic, the former tubal and generally dependent on atmospheric vicissitudes and exposure, the latter vesicular and originating under atmospheric organic foulness. The curability, or often non-renewal of diseased action of the pneumonic variety is not so frequently observed in the bronchitic form, the rationale probably existing in the possibility of removal of the existing respiratory vitiation as contrasted with the difficulty of avoiding atmospheric variations and currents of air. The distinction of acute and chronic in this variety, carried out in the brief sketch of the subject at page 287, has not been retained in this subject matter; although interesting as showing the relative frequency with which lung destruction is associated as a sequel, yet in nature and origin and morbid anatomy they are in unison; clinically, the prodromal stage is shorter in one than the other, anatomically there is more extensive derangement of the tubes and lung skeleton in the chronic lesion, thus the divergencies are a mere matter of degree, and will be noted in the sequel.

As an example of the morbid anatomy, let us take the following:—

The lungs did not collapse on opening the chest, old and dense pleural adhesions surrounded the apices, recent but firm lymph covered the right base, while the corresponding portion of the left base indicated a still more recent lesion, being easily separable by the hand. A corresponding condition characterized attachments to the diaphragm and to the pericardium on each side. Cavities were broken into on taking out the lungs.

The right viscus weighed 2 lb. 14½ oz., capacity 84 cubic ins., specific gravity ·959. The lobes were firmly agglutinated, substance generally consolidated, the extreme base and thin edges being the only portions crepitant; on section tough and resistant. The upper lobe was the seat of one large cavity, whose boundary was the thickened pleura at the apex and a thin layer of tough indurated lung tissue at the sides. The excavation contained a small quantity of mucous fluid,

no distinct lining membrane, but limited by dense fibroid material thrown into ridges by external constriction, and corresponding in nature to the surrounding lung tissue of the upper lobe. Communicating was a large bronchus, terminating abruptly in the cavity as though divided across by prior ulcerative action. The middle lobe was generally consolidated, of firm tough consistence, the upper portion was airless, the lower sub-crepitant. Frothy mucus oozed from the larger bronchi on pressure, while a clean gelatinous airless fluid occupied the smaller branches. Towards the periphery of the viscus, at the extreme upper portion of this lobe, was a small cavity partially filled with purulent fluid and broken up *debris* of caseous material, and around it were grouped miliary tubercles limited to a radius of two inches from centre of the cavity. Interspersed elsewhere were isolated lobules of crude caseous material, firm, with no apparent tendency to disintegrate. The intervening lung substance in the upper part was consolidated into a greyish mass, the lung giving the idea as though injected with gelatine; in the lower part the tissue was œdematous, but permeated by air. The section of the bronchi showed that their walls were much thickened and dilated occasionally into beaded or oval cavities, averaging $\frac{1}{3}$ inch in diameter and containing muco-purulent fluid. The lower lobe was studded with lobular consolidations, and the interven[illegible] parenchyma was œdematous; the thin edges were emphysematous.

The left viscus weighed 2 lb. 13½ oz., capacity 82 cubic in., specific gravity .961. The upper third was the seat of a cavity identical in nature and aspect with that in the right lung; the middle third was consolidated throughout with gelatinous infiltration in the air cells; in its upper portion the contents of some lobules had undergone cheesy degeneration, and gave the same characters as those in the middle lobe of the right viscus; the lower third was œdematous but crepitant. In this lung also were cavities formed by dilated bronchi, and in both fibrous strands diverged from the root of the lung to the periphery, and also from the medium-sized and smaller bronchial tubes into the surrounding parenchyma.

The bronchial glands were enlarged, firm, and gelatinous on section. On opening up the bronchi, the larger ones contained sanious frothy fluid, and the mucous membrane was vascular, softened, and eroded in patches; in those of medium calibre dilatations had ensued; in the broncheoles the congestion was at an acme, and the contents were either a gelatinous fluid very rich in cell forms, or a purulent product. On tracing up the broncheoles they were seen to terminate in the centre of the consolidated lobules, the component air-vesicles being arranged in a racemose manner as berries around the stalk of a bunch of grapes.

Like the sub-acute pneumonic form this variety of destructive lung disease is essentially gradational in involvement, and it is rare indeed that in the one viscus we cannot read the progress of events which has culminated in the most advanced disease present in the case. It may be that the original lesion is of such a severity and range as to implicate the major part of both viscera; but three,* or at least two, distinct disease ages are the generally observed features, the upper lobes predominating in degree. Commencing at the base we shall find that the bronchi, and especially those of a medium calibre, are highly injected with blood vascularity in the mucous coat, and contain a thick glairy reddish mucus; that the lung substance is congested and œdematous, with interspersed lobules at a more advanced stage, and that the external fibrous coat of the broncheole is hypertrophied. This condition of the tubes is anterior to the involvement of the lobule, and can be seen to exist in parts in which no consolidation has ensued. Following this is the occlusion by product accumulation of lobulettes or lobule, either isolated with intermediate tissue crepitant, or aggregated into a tract, the occluding material in the air vesicles resembling that in the corresponding broncheole, and giving the idea as though injected by the air passages from without, very rich in large cell-forms,† and in

* *E. g.*, "Upper portion of lung the seat of a large, old cavity, divided into "loculi by fibroid bands; lower portion of upper lobe studded with lobular-caseous "consolidations, lower lobe with recent gelatinous infiltration, in isolated lobules or "coalesced patches."

† Plate I., figs. 1, 2, and 3.

aspect likened by Niemeyer to "frogs-spawn." The intra-vesicular mass becomes cloudy, and, to the naked eye, like tallow, ultimately assuming the well-known features of cheesy degeneration,* and extending with like characters into the broncheole. According to the extent of involvement and degree of dispersion of the caseous material will be the features depicted on section of such a diseased lung. In some parts the mass is somewhat conoidal in shape from occupying a part only of the lobule—a lobulette; in others the crenelated outline of the lobule is the limiting zone, and by careful dissection the diseased portion may be isolated, when the resemblance to a bunch of grapes will be apparent, the broncheole the stalk, the opaque solid air-vesicles the berries; should the section leave the lobule intact, and pass through the feeding capillary bronchus only, then the aspect of the crude material is that of a dot, and often passes for miliary tubercle, unless differentiated by careful dissection and by the microscope. Superadded to these changes in the interior of the broncheole and air-vesicle is that external to them, consisting in proliferation of the fibroid tissue elements composing the framework of the viscus;† this hypertrophy is connected with the long continued vascularity and engorgement of the bronchial mucous membrane, and is explained by the anatomical distribution of the bronchial arteries, as set forth by Dr. Waters; it is a constant factor in this variety of consumption, and gives the firm, tough consistence to the viscus so especially apparent as to appear diagnostic.

On taking up a lung the seat of catarrhal phthisis, three naked eye-features are especially conspicuous:—

(*a.*) The prominence of the bronchial tubes in the section, the excess of space occupied by them as compared with health or other varieties of pulmonary consumption, their creamy thick purulent contents.

(*b.*) The isolated racemose arrangement of many of the caseous masses.

(*c.*) The strands of fibroid tissues permeating the viscus.

As examples of the bronchial lesion I may quote the following observations of individual necropsies:—

"Larger tubes filled with tenacious purulent fluid and with the mucous "membrane extremely vascular, on following up the subdivisions the contents "are thicker and more pus-like, increasing in consistence towards the capillary "tubes and air cells; the lining membrane of the broncheoles is highly vascular, "swollen, and the external alveolar tissue much thickened."

"Both lungs on section, from apex to base, give an appearance of being "studded with yellow dots, the size of a large pin's head, marked by a central "orifice from which purulent fluid can be expressed (catarrhal inflammation "of broncheoles). The bronchi leading to the disintegrating portions of lung "are dilated and filled with opaque fluid, and surrounded by fibroid induration "of the lung substance."

"Minute ulcerations are present, consisting of white lymphy patches set in "intensely congested mucous membrane, and extending from the main division "of the large tubes into the capillaries."

The degree of involvement of the bronchial tubes varies much in individual cases; it also is a constant factor in this variety, and is especially apparent in those instances in which the prodromal catarrh is extended over a lengthened period, chronic.

The involvement of the pleura in this variety is predominant, and when allowing of observation the excessive vascularity and development of new vessels, both in the parietal and visceral layer, is very noteworthy. This thickening of the surface membrane is superadded to the induration of the viscus, the sequel of the bronchial irritation, and on section bands of fibrous tissue, following the anatomical arrangement of the lung sketeton, are observed to pass in from the circumference, meeting those radiating from the tubal

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* Virchow, referring to this subject, remarks:—"Perhaps also the aspiration of "the cellular elements from the smaller bronchi, by which the quantity of cells "formed in the alveoli themselves is still further increased, causes, in a purely "mechanical manner, the cells thus densely packed together to encroach upon each "other, to shrink, to undergo necrobiosis."

† Plate I., fig. 2.

ramifications, mapping out the tissue into districts, and forming a boundary-line between one consolidated lobule and its neighbour. From this results such a *post-mortem* condition as under:—"The cavities were of two kinds, "the one dilated bronchi bisected, the other occupying the site of prior caseated "products. There was no inflammatory tubercle left, all had been expelled; no "miliary growths; there was merely the fibroid skeleton left after ejection of the "softened caseous masses, giving the viscus the appearance of being areolated."

The breaking up of the diseased texture follows in this variety the same phase as in the preceding; it disintegrates from inherent defects of vitality of its components, or from slight disturbing agencies in its neighbourhood. The limitation of the cavern is the hypertrophied lung stroma, the size of it is dependent on the prior isolation or coalescence of the lobular consolidations; if the latter, the cavity is large, with a very irregular outline; if the former, then multiple small excavations permeate the viscus; these (*i.e.*, the smaller) are invariably present to a greater or less number, and not uncommonly a series of caverns, varying from a nut to a small walnut in size, typifies the nature of the destructive agency. The resemblance of the dilated tube with purulent contents to the softened caseous pulmonary lobule is well known, and a not unfrequent counterfeit of tubercle is the section of a broncheole "with cheesy contents, or whose walls are thickened and surrounded by 'alveoli filled with a cheesy infiltration" (Niemeyer).

The frequency of emphysema in this variety is especially conspicuous, and often lobular in arrangement, apparently dependent on the broncheolar lesion, and observed in parts entirely free of all caseous products.

With reference to the complications of pulmonary consumption and the lesions in the other viscera, the only one calling for especial remark under this variety of diseased action is the miliary growth. This adenoid development is more frequently observed in the catarrhal form than in the other inflammatory varieties, the associated conditions of the tubes, with their rich lymphatic supply, furnishing the requisites of infective agency in the highest ratio. These growths are, equally as in the other varieties, to be found grouped around the disintegrating caseous mass in process of excavation, but that which differentiates this variety is the arrangement of the nodules in relation to the smaller bronchial tubes; here, on opening up the muco-purulent distended air-passage, these nodules are seen to accompany it in length, and forming a zone around it extending into the pulmonary tissues for some short distance, the terminal bronchi not uncommonly finishing in lobules of intra-vesicular consolidation. A bronchial dilatation, with purulent contents, is also a favouring focus of dispersion. Unquestionably they prefer the bronchial site to the parieties of excavation; probably the liquid purulent fluid and the comparative thinness of the limiting wall allow of more absorption and transfer by lymphatics or veins, than the thickened lung substance around a disintegrating thickish caseous mass. In this variety, as in the preceding, these miliary tubercles are no necessary component of the series of changes terminating in lung disorganization, they are no necessary adjunct to the bronchial lesion; it is easy to obtain specimens in which apparently the concomitants are in full force, yet the adenoid result is not detectable; but when found, they are arranged as above stated. A not uncommon condition of lung is,—an old cavity or cavities in the apex, caseous lobules beneath them, the lower half of the viscus congested with patches of emphysema and scattered hepatized lobules; on slitting up the bronchial tubes permeating it they are found vascular, dilated, and pus-containing, with a miliary zone of tubercles following their linear branches; the nodules are not present in the old diseased patches of caseation not disintegrating, they are entirely limited to the immediate surrounding of the smaller tubes prior to their becoming broncheoles or capillary. This arrangement of the miliary growths would appear pathognomonic of this variety of pulmonary consumption; at least, I have not been able to detect it in any other. The nodules are developed in catarrhal phthisis at a much earlier stage, and even it seems possible that in some instances their production around the infecting tube may be co-etaneous with the intra-vesicular lobular consolidations; but although some portions of the diseased texture may bear out this deduction, yet the whole evidence substantiates

their being secondary and complicatory to a prodromal inflammatory lesion and its diseased products.

It is more especially upon the features (clinical and pathological) of this form of consumption that the theory of the inflammatory nature of many cases of phthisis is based. The prodromal stage is so apparent; the phase of lung-destruction, as a sequel in point of time and chain of events, is equally conspicuous; while the post-mortem data of what may be termed interrupted examples tend to corroborate the ante-mortem course of involvement. Take as an illustration the following case:—A well developed soldier, with no traceable hereditary tendency, but an undermining of health from frequent gonorrhœa, soft chancres, and suppurating bubo, from getting wet, and long-continued exposure, suffered from bronchitis, which recurred, and ultimately merged into symptoms of lung disorganization classified as phthisis, the ordinary progress of the affection being cut short by an attack of pleurisy terminating life. At the necropsy there was no disease present beyond the thoracic limits. The left lung was compressed against the spine by about 70 oz. of purulent fluid; the pleura was coated with a soft, thick pyogenic layer; the lung substance was carnified, and on section the upper and middle portions were the seat of smooth cavities filled with sero-purulent fluid, and evidently mere dilatations of the bronchial tubes; no caseous mass, no miliary tubercle. The right lung was swollen and crepitant, but with interspersed congested patches; the lobules were very conspicuously mapped out under the pleural membrane, and a few towards the base were emphysematous. On section the lung substance was hyper-vascular, yet permeated by air; the medium and smaller-sized bronchial tubes were filled with muco-purulent fluid, their coats swollen, congested, and dilated into cavities, which when cut across exactly resembled abscesses. A few scattered lobules were consolidated by accumulated cell elements, firm and opalescent; three or four had advanced beyond this stage, and had progressed to caseation, yet with no appearance of softening. In two spots, one at the apex and the other towards the base, were grouped miliary tubercles around broncheoles distended with pus and near to a dilatation with like contents; in one (the apex) the miliary growths on the one side of the dilatation were closely compressed and limited in dispersion by a band of fibrous tissue (hypertrophied lung stroma), on the other they were widely dispersed. What in this instance was the nature of the lesion classified as phthisis? It clearly was not tubercular, for the miliary growths present were few, limited to two spots in one lung, and that not the most advanced, and combined not embracing a greater area than two cubic inches. It was not lobular pneumonia with caseation and disintegration, for this also was very sparse and limited to one viscus. The one common feature to the whole diseased texture, and evidently in advance of all other phases of degeneration, was the tubal lesion and the dilatations; there was no accomplished disintegration of tissue, the evolution of the diseased action had been stopped by death anterior to this. That the capillary bronchitis did not originate in the irritations of miliary growths is clear from their circumscribed limits; there was no predisposition by inheritance; there were the clinical features of tubal inflammation from external causes in a debilitated frame; there were the *post-mortem* facts of pulmonary disease—general bronchial lesion and dilatations, very partial lobular consolidation, caseation, and adenoid growth as sequelæ.

The differentiating features of this form of consumption are—

(*a.*) A prodromal bronchial inflammatory lesion from external agencies, often recurring and chronic.

(*b.*) As a sequel, superadded symptoms of lung consolidations and disintegrations to the tubal lesion, the latter gradually merging into the former by imperceptible gradations; the lung-destruction generally bi-lateral though often showing an ascendency of the one viscus over the other, and commencing in the apex implicating the organs in successive stages.

(*c.*) Pathological data. Extension of the process from the broncheole to the lobule; the gelatinous aspect of the hepatization and the epithelium-like cell constituents; the hyperplasia of the fibroid skeleton of the viscus from long continued bronchial irritation; the degeneration of the tube walls and their dilatation.

(*d.*) *Post-mortem* data. Gradations of diseased action from the frogs-spawn infiltration of the lower lobes to the tough apex cavity; the isolation of the lobule or lobulette consolidation; the number and smallness of the cavities, or irregularity and locular arrangement of the outline, if large; the toughness and fibrosis of viscus, the phases of inflammatory action in the tubes, their pus-contents, dilatations, and thickness; the miliary growth arrangement linear to the smaller tubes and broncholes.

General Remarks upon the First Group—Primary, Inflammatory, Idiopathic Lung-destruction.

In the preceding pages a description has been given of each component variety of this group, and the differentiating features, clinically and pathologically. Under the present heading it is proposed to consider points common to all varieties as a class, and to describe the associated visceral complications.

We may arrange these details in the form of propositions, as under:—

(1.) The individuals exemplifying this group are free—at least for the major part—from any special type of inherited bodily conformation or structural peculiarities indicative of a constitutional diathesis or tendency to a special form of morbid textural changes and deteriorations.

(2.) The individuals do not as a rule present, as antecedents to the pulmonary lesion, evidence of prior morbid processes of a strumous or tubercular diathesis, *e.g.*, cicatrices of special ulcers, glandular enlargements, &c.

(3.) Taking the accurate and indubitable evidence furnished by the admissions into hospital throughout the army, the only forms of disease arranged under the tubercular series numerically important in causing sickness are "phthisis pulmonalis" and "hæmoptysis," the combined remainder being, as compared to these two, utterly insignificant; while as regards the mortality of the series, a death from any other item than "consumption" is a rarity.

(4.) The clinical history and morbid anatomy of 44 per cent. of these cases exemplify an entire limitation of *all* diseased action to the pulmonary tissues,* fully justifying the tabulation of this group under "local diseases," with a tendency to complications and dispersion of derangements to other viscera, not special to the group, and variable in their nature.

(5.) The nature of the primary morbid process in the lung textures—originating in them, centred in them, and often limited to them—is essentially inflammatory, the phases of its operation in these viscera being co-equal to those brought about by the same process on the body suface—inflammatory engorgement, accumulation of products, abscess formation or gangrene, caseation, softening, ulceration; liable likewise to the same complication under the same conditions—the development of miliary nodules (adenoid outgrowths) from the focus of infection.

The first three propositions, referring to the antecedents of the lung disease and the nature of the constitution with which it is associated are based upon the statistics of the recruiting and the yearly records of the army at large, as given in the series of departmental reports.

The figures from the recruiting department, ranging from 1860-69, will demonstrate that of every 1,000 presenting themselves as willing to engage during this period, an average 405 were declined on account of actual disease or deficiencies likely to predispose thereto under military service. Of these total rejections, the proportion of those showing conditions tending towards the special class of diseases now under consideration, either actual or potential in agency, is arranged in the individual items as under:—

* Dr. Wilks, in his *Lectures on Pathology*, p. 245, states:—"In many cases of "phthisis there is no disease present except in the lungs."

Average of 10 years, per 1,000 presenting as recruits ..	Syphilis	16·58
	Scrofula	12·18
	Phthisis	7·31
	Lung disease other than Consumption	4·39
	Deficient development and general debility of frame	35·79
	Malformed chest or spine .	37·01
	Total rejected per 1,000	113·26

With such an extensive weeding of men,* under a scrutiny which rejects the slightest trace of scrofula, want of development or general debility of texture, and existent disease—not confined to one, but a double examination by independent individuals, and rendered yet more strict by the pecuniary mulcting (not at present extant) of the enlisting surgeon if defects were overlooked—the freedom from all disease† or trace of its prior existence in the mass of recruits may be fairly deduced, and from it also the absence generally of a diathesis which rarely fails to make itself conspicuous within the first 18 years of life. If, again, we look to the personal qualities of those enlisted, we find the following characteristics of this decennial period :—

The majority were,	18–19	years of age,	to the extent of	27·7 per cent.
„ „	5 ft. 6 in.	in height	„ „	26·0 „
„ „	135 lbs.	in weight	„ „	25·3 „

with a minimum of 33 inches chest-circumference.

A standard of correlated age, height, and weight is given by Professor Aitken,‡ the sum of observations of Mr. Danson on 4,800 criminals, who, as a rule, are far from being the least able-bodied of the community. At the age of 18–19 the average body-height was 5 ft. 4 in.; weight, 126 lb. From Mr. Harrison's inquiries the average chest-circumference, 17–18 years of age, is 27½ in., with a maximum of 34 in. Dr. Aitken elsewhere remarks: "If 18 be "the minimum age fixed for the enlistment of growing lads, then the height "should be as near as possible 5 ft. 4 in., and the weight 112 lb.,"§ adding the tables of Liharzik, who at 18 years found the average body-length to be (reduced to English measure) 64 in., and chest-circumference 30·7 in. Contrasting these civil details with the enlisted men, we observe at the same age a marked excess of weight and chest capacity in the recruit, with an increase of height of about 1·5 in., the latter *per se* an undoubted source of weakness, yet counterbalanced by the proportionate extra development of the body generally, and thorax in especial. At p. 372 it is pointed out how rapidly the impetus to growth and chest-expansion, under good food and training, is set in operation after enlistment; and the *post-mortem* details of those dying of phthisis evince that even after all the emaciation from long-continued visceral lesion there is yet a chest-circumference of 31·5 in. average, the extremes being 28¾ in. to 36 in.

The strumous diathesis is expressed in "impaired nutrition of the funda- "mental parts of the frame, imperfect growth, especially of the skeleton; this "the nervous system and intestinal tract, weakness of cell-growth in the skin "and mucous membranes, delicacy of vascular system and want of symmetry "in the skeleton." "It is especially powerful during childhood and develop-

* Bearing this in mind, the Sanitary Commission for 1859 state that in comparing the civil and military mortality "an estimated amount should be added to "the army rates for those who from sickness or conscious inability do not offer them- "selves," or "who offer themselves and are rejected on examination for enlistment; "and the deaths of invalids and pensioners should be transferred to the army rates "from the civil rates in which they are now included."

† This is corroborated also by the statement of Professor Parkes,—that the first years of enlistment are to the advantage of the soldier, comparing his general mortality during this period to that pertaining to the some ages in the civil segment.

‡ *Principles and Practice of Medicine*, vol. ii., p. 25.

§ *Growth of the Recruit*, p. 48.

"ment, and leaves indelible marks not to be overlooked."* A scrutiny of these details will show that in absence of disease, in freedom from predisposition, and in bodily configuration, we may fairly regard the recruit passed as a "chosen "man," decidedly above the standard of the community at large; and although there may be room for improvement by a more accurate correlation of the height to the average age standard, yet, at the outset of his career, there are no tangible points from which we could predict the excessive ravages of "lung-"disorganization," far in advance of the class from which he is drawn, even when the contrast is partially neutralized by the addition to the latter of rejections and invaliding.

Turning, moreover, from the date of enlistment to the subsequent career, the absence of all trace of an explanatory diathesis is clearly shown in the annual statistics of sickness and mortality. Taking the period 1861-68 inclusive, the admissions under Order 2, Class 2, comprising phthisis, hæmoptysis, and all forms of tubercle or struma, together with the proportion of the two former to the total sickness of the class, are as follows:—

	Tubercular Admissions. Average Annual Ratio per 1,000 of Strength.	Proportion of Admissions of Consumption as a percentage.
Whole Army	13·0	80·6
Home Troops	14·1	79·1
Foreign Service	11·9	82·1
Household Cavalry	10·6	98·1
Foot Guards	19·1	82·5

Thus while the chest affection, generally giving but one admission per case—especially among the Guards (as may be seen by comparing the admissions with the loss in the Table, p. 360)—produced 80·6 per cent. of the total sickness from tubercular diseases, the bulk of the lesions producing frequent admissions, and for which constitutional infirmities *might* be inferred are illustrated in 19·4 per cent. in a class of diseases which, in the United Kingdom, caused an average 11·9 admissions per 1,000 of strength, 2·95 deaths, and 4·75 discharged. If we consider that the above figures represent every section of the army, under every condition, and over an uninterrupted period of nine years, with such a small proportion of admissions, and infinitesimal importance in the death-rate and invaliding of all the other *acknowledged* forms of disease due to a strumous diathesis, how unsubstantial becomes the basis of its existence to explain the preponderence of pulmonary consumption! Excluding phthisis and hæmoptysis, the tubercular class of disease is rarely exemplified in the service, and attests the great care of the recruiting officers and the strict scrutiny brought to bear on its elimination. In 10 years the household cavalry, while undergoing an annual loss by pulmonary consumption of 10·04 per 1,000 of strength, had during the whole period but *two admissions* from strumous affections—one tabes mesenterica, one scrofula. The Foot Guards gave an annual sickness from the tubercular class, excluding consumption, of only 3·1 admissions per 1,000. The Military train, giving the smallest amount of consumption in the home troops, had admissions from struma somewhat in excess of the Guards; but the same features are everywhere evinced—a minimum sickness and fractional loss from all other combined tubercular diseases, with a maximum temporary and enormous permanent loss from consumption.

A perusal of these facts must satisfy the most exigeant and sceptical inquirer that the cause of lung-destruction in the service must be elicited from other conditions than inherent defects in the recruit enlisted or a constitutional diathesis subsequently unfolded.

The historical summary of those exemplifying the disease fully attests the rarity of strumous or tubercular affections leading up to the consumption,

* *Principles and Practice of Medicine*, vol. ii., p. 24.

and shows such a small percentage with an "inherited tendency,"* that, considering how few families in any class of society can trace a freedom from loss in one or more of its branches, in the existent or previous generation, may practically be disregarded in explaining the main mass of the consumption, and especially that large amount in excess of the corresponding class in civil life. As previously stated, also, the frames of those dying suggest no mean average of prior vital capacity of lungs, while the memory of any regimental medical officer can recall only too numerous examples of stalwart soldiers showing but little more exemption from the onset of the insidious lesion than the comrade of average body-strength and development.

On the subject of hereditary predisposition it is true that the knowledge of the ancestral tree of any one of us, so far as disease transmission is concerned, becomes very vague and uncertain when stretched beyond the grand-parents, and hence a lurking unknown tendency that has remained quiescent for one or two generations may be present to rightly account for some few instances of consumption where the immediate family history is clear of all trace of disease, even as physical peculiarities, overstepping one or more generations, may reappear in the more recent offspring; yet if the tendency to lung destruction be one among many exponents of a general diathesis, strumous or tubercular, and not a mere transmitted weakness of a viscus to any various disease agencies which may be current, then we might fairly infer that other exponents of the diathesis would be present equally with the consumption, and the all-but constant absence of these lesions would necessarily raise a great doubt on the specific origin of the latter; certainly the mere existence of the lung disease, unsupported by other data, could not be regarded as expressive of the latent transmitted diathesis. This, however, while possibly accounting for some few examples of the disease among the military equal with the civil community, leaves untouched the present overplus of the former segment and the enormous excess of former years, the reduction of which by improved external surroundings of life minimumizes the importance of inherited tendency in the scale of causation.

It must, however, be borne in mind that the above remarks apply only to the recruiting up to 1869 as capable of influencing the statistics of consumption of the second part of the essay carried up to the same date; what will be the result of the lessened standard of body development now in vogue especially for the line regiments, the youth of the recruit, and the diminished strictness of selection on the phthisis prevalence when the enlisted individual is subjected to the pack and barrack atmosphere is an open question for the future to decide, but judging from analogous circumstances it can hardly be for good.

The propositions 4 and 5 relate to the lesion itself and receive elucidation in the succeeding observations.

Nature of the Lesions, Local and General.

In a percentage of 44 all diseased states were concentrated in the lungs, the remaining organs and tissues being healthy.

In 14·2 per cent. the disease was limited to one viscus, in 85·8 it involved both; in 33·3 equally; in 38·3 with an excess in the right lung, in 14·5 the left predominated.

In 68·5 per cent. the form of the morbid material in the lung textures was that known as "the inflammatory or yellow tubercle"—caseous degeneration of the intra-vesiculary products of disease; in 31·5 per cent. "miliary growths" were superadded.

In 56 per cent. lesions in other organs than the lungs were present in sequence to the morbid action there existent, consisting :—

* Dr. C. T. Williams (*Med. Chir. Soc.*, Jan. 10th, 1871) substitutes the term "family predisposition" for "hereditary tendency" in order to "include brothers, sisters, and first cousins," and on this basis states that in "1,000 instances" in "the upper and middle classes" such predisposition was present in 43 per cent. of the males and 57 of the females, and "in nearly one-half the cases only *brothers and sisters* were affected." It is obvious that any comparison of the soldier on such a basis is frustrated by his long absence from his home or native town, and his general ignorance of details of family history subsequent to enlistment.

In 56 per cent. of intestinal complications, ranging from catarrh of the mucous surface to ulceration, and with or without the accompaniment of "miliary tubercle."

Diffused miliary generation presumably from the lungs as a focus was found in the other viscera as follows:—kidneys, 8·6 per cent.; brain meninges, 5·5; liver, 3·1; peritoneum, 3·1; spleen ·7.

In 12 per cent. the larynx was implicated, from vascularity to ulceration and necrosis of the cartilages.

In 23 per cent. the kidneys were either lardaceous or cystic.

In 26 per cent. the liver was either lardaceous, fatty, or both combined.

In 19 per cent. lesions were present in the pericardium, heart, or aorta.

In 14·5 per cent. the brain, meninges or cranial bones evinced abnormal states.

The average duration of these cases of disease is very difficult to arrive at, inasmuch as the recorded dates refer only from the last involvement up to death, and do not take cognizance, as a rule, of those prior attacks which are elicited *post-mortem*; however, the few carefully ascertained cases gave an average length of 4½ years, and 1·2 year's duration of last involvement.

In the generality the extinction of life was gradual through progressive exhaustion and diarrhœa, but in a minor proportion interruption of this general wasting ensued by—

(*a.*) Hæmoptysis from cavities;

(*b.*) Dyspnœa from engrafting of extensive congestion or inflammatory changes in the healthy tissues;

(*c.*) Pleuritic effusion;

(*d.*) Empyema and hydrothorax from softening of an adjacent patch and formation of an opening into the pleural sac not previously obliterated;

(*e.*) Menigeal involvement, delirium, coma; arranged in the relative frequency of occurrence.

Lung lesions.—Commencing with these viscera as the foci of invasion we shall find the morbid deposits are to be arranged according to their anatomical relations; (*a.*) intra-vesicular; (*b.*) extra-vesicular.

(*a.*) These occupy the interior of the air cell occluding it, the lobulette and the lobule, and occasionally passing into the broncheole. The component elements are cells epithelium-like or spheroidal (the former characterizes the bronchitis varieties, the latter the pneumonic) average $\frac{1}{1200}$th of an inch in size, nucleated and granular, the condition of these varying according to the age and stability of the morbid material. In the early stage the mass is semi-transparent and gelatinous, the cells below the average in size, bi-nucleated, and showing signs of recent growth. In the mature state the colour is of an opaque white, firm yet friable, the cells are large, nucleated, and granular, extremely closely packed together. In the caseation the mass is opaque yellowish, putty-like, with strands of fibroid tissue running through it (the lung stroma), the cells are very small with shrivelled-up outline enclosing one or more clear refracting granules. In the disintegration the mass is more or less fluid, pus like, the cells are fatty degenerated, ruptured, and mingled in a molecular *debris* of fat, granular particles and tissue shreds. These cell elements, within the area of the respiratory membrane at its cœcal expansion into the vesicle, occupy a tract of lung substance from a lobulette to a lobe, irregularly scattered or aggregated in distribution,* and undergoing the phases of the "inflammatory tubercle," from complete absorption, leaving only a puckered cicatrix as a land mark of prior lesion; partial, leaving a cretaceous

* The infiltrated form of the *soi-disant* tubercle. Most museums contain examples of this in the crude state, as well as preparations of grey and iron-grey hepatization of the lung tissue. So closely approximate are the naked-eye characters of the former to the latter that without the assistance of a catalogue it is impossible to differentiate them: limited to naked-eye morbid anatomy details the preparations are often interchangeable. Are they not equally so in minor details, in nature, and pathology?

mass; quiescent, as a caseous nodule occasionally surrounded by fibroid tissue; disintegrating, leaving a cavity to contract, to become latent, or extend.

This diseased cell product is invariably present in the group of varieties we have been previously discussing.

In an example of this morbid mass when injected from the arteries the whole diseased portion is seen to be extra-vascular, no injection penetrating it, at least so far as the smaller vessels and capillaries are concerned, though possibly one of the larger ones permeating it may still be pervious. Surrounding it the vessels are patulous, normal in size, or not unfrequently hyper-vascular. Dark pigment also is not uncommonly deposited in the tissues around the caseous mass and this more clearly distinguishes to the naked eye the yellowish white opaque dead and caseated elements from the healthy surrounding tissue. If a thin section of this mass be made, well saturated with dilute liquor potassæ solution, subsequently well washed to get rid of the intra-cellular elements and stained with magenta or carmine to bring into strong relief any nucleated tissue, the lung stroma will be found to have undergone but little, if any, morbid change; possibly it may be somewhat granular or hypertrophied, but not unfrequently it cannot be differentiated from healthy lung tissue; certainly no adenoid tissue, nor any nucleated particles liable to be confounded with it are present.

(b.) These extra-vesicular disease products occupy some portion of the lung stroma as a miliary nodule or strand of hypertrophied fibroid tissue with occasional excess of pigment.

The former is peri-bronchial, peri-vascular, inter-vesicular, or sub-pleural in site; when seen by the naked eye the nodule appears as a small firm spherical tumour, separable by needles from the tissues in which it is placed. Under a low magnifying power (30 diameters) it is observed not uncommonly to have a central portion darker than the rest, giving the idea of a kernel, not apparent in the smaller ones as a rule;* the outer rim is made up mainly of fibrous tissue, the kernel of adenoid elements; the normal parenchyma is displaced and encroached on. The ultimate elements are particles which, individually separated, have an average size of $\frac{1}{4000}$ of an inch.† These *in situ* are closely packed together and have a central darkness which, with acetic acid, is decidedly nuclear, and gives the idea of nuclei surrounded by a firm gelatinous material. Interspersed are delicate fibres as a stroma; in some instances hardly to be recognised, in others very strongly pronounced forming a framework not unlike the cells of an honey-comb, and from which the nuclear particles may be easily dislodged by washing.‡ The nodule is at first small, hardly visible to the naked eye, firm, semi-transparent, and grey; rarely seen in the cases of this group of consumption in any other condition or larger than a millet seed; it may advance *per se* to the size of a large pea or bean, become opaque, caseous, soften and disintegrate, or retrogress to a fibrous-like mass or cretify; but, as a rule, its course is marked by the adjunct of inflammatory processes within the air-vesicle and the combined subsequent phases of pathological changes.

Occasionally in the early stage, and rarely absent when as large as a hemp-seed, the nodule is seen to have a fibrous capsule which not unfrequently can be discerned with the naked eye. The capsule has intimate connection externally with the fibrous tissue elements of the viscus, and from it internally strands pass into the mass forming septa. When seen at its earliest the nodule is observed to be composed solely of the adenoid elements and delicate stroma arranged in whorls from a centre, and so it may increase without further adjuncts even to the size of a millet-seed; but in the majority of examples in the lung, in growing it encroaches on the stroma of the air-vesicles which it incorporates into its own mass, the intra-vesicular area collapsing, hence, on microscopic examination the fibrous air cell framework is seen passing through the nodule, yet always distinct from the adenoid particles, being incorporated in the mass, yet not implicated in the growth nor transformed. This feature would appear to form a distinct boundary line between the miliary elements and the fibrous tissue elements and completely to differentiate them in nature; for, if not dissimilar in nature and origin it is difficult to understand how the fibrous strands can remain intact and distinct (even at any age or stage

* Plate I., fig. 4. In the sketch, both in the smaller and larger one, this feature is exaggerated.

† Plate II., fig. 4. ‡ Plate II., fig. 5.

of the nodule) with active growing agency in their direct vicinity; they are evidently independent of the morbid process in operation in tissue adjunct to them but different in nature.*

These nodules may be seen as above described perfectly isolated from each other, but more frequently processes are observed passing from them, freely communicating with each other and connecting contiguous nodules. These processes are best seen in an implicated omentum (Plate 1, fig. 6). Here, diverging from the nodules are cord-like strands of adenoid particles, which either pass direct to another nodule, or are connected with the peri-vascular adenoid tissue, or, on the other hand, getting smaller in size by giving off branches which freely anastomose and which may be traced ultimately as connected with delicate channels in the tissue corresponding, in all details, with the lymphatic plexus normally present. An illustration of this is given in Plate 2, fig. 1. The delicate channel reticulum $\frac{1}{6000}$ to $\frac{1}{7000}$ inch in diameter was seen not uncommonly to commence in a branched nucleated cell, to anastomose freely, to join forming larger and nucleated strands which, on the one hand, were connected with the adenoid peri-vascular tissue, and on the other hand merged into the miliary nodule. Such an example would appear to place the connection of the miliary nodule with the lymphatic tissue, in site and nature, beyond doubt.

Equally also the same features can be traced in the lungs. These cord-like strands either pass along the bronchus or vessel forming a plexus surrounding it, or around the air vesicle. In the latter case the nodule is surrounded by compressed air vesicles whose walls are more clearly defined nearer the circumference of the mass than elsewhere; this feature, with a higher power, is explained by processes of adenoid tissue passing for a varying distance from the nodule between the air vesicles forming a plexus which, more or less, surrounds the air vesicles, compresses them, and renders their contour irregular. With a power of 500 diameters the adenoid particles are noted as clearly delineated from the fibrous elements of the vesicular parieties, and this is a point which, as far as I have been able to extend this inquiry, is constant under all conditions, apparently determining the non-identity of the nodule with the cellular tissues.

Changes may ensue in the nodule, or in the parenchyma of the tissues; they consist in degeneration of the adenoid particles, or sub-acute and chronic irritative processes in the lung stroma or the epithelium of the air vesicles and broncheoles, and ulterior changes in the products of the induced inflammation.†

The other extra-vesicular disease product of the lung stroma are the strands of fibroid tissue forming thickenings of the pulmonary framework and due to proliferation of the nuclei leading to fibre-cell productions.

These diseased products are not constant in the varieties of lung destruction embraced under group 1; the adenoid nodule is regarded as accidental and complicative; the fibrosis is general in the tubal varieties of consumption, and local in the other form as an occasional residue or associate of the crude or expelled caseous mass.

Of these morbid products the main interest in this group of phthisis is

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* I need but mention the intimate interlacement of the lymphatic and cellular tissue elements in all regions of the body to show that something more than site is necessary to differentiate the hyperplastic action into growths of the one from the other, and this differentiating feature the microscope appears to furnish.

† It will be observed that in the foregoing remarks I have spoken merely of the adenoid elements in excess amassed as a nodule with circumscribed strands emerging from it, and omitted all description of them as an infiltration. I have so done because that I have been unable to detect examples which would bear the latter designation dissociated from the miliary nodule. In early pyæmic lung destruction there is an unquestionable strongly nucleated tissue independent of nodules between the air vesicles, and this developes into large inflammatory cell forms; but any clearly defined tissue of the structure of the miliary growth in the character of an infiltration, apart from the nodule, in the lung destructions of Group 1, I have failed to detect. I am aware that in so stating I am running contrary to many observers. Referring to these points, Dr. Wilson Fox remarks:—"If tubercle be only grey granulation, "its demonstrable part in the destruction of the lung is small; if tubercle may be a "diffused growth, passing into caseous change, its production of phthisis is large."

centred in the first as constant and necessary, and secondary in the miliary tubercle as occasional and complicatory; the origin, nature, and relations between these forms essentially concern us, as upon these the theories of pulmonary consumption rest so important in connection with prophylaxis. "It is the yellow product formed in the cells which is the more important, as "in many cases no miliary tubercle can be discovered, and I regard it as an "accidental circumstance whether it be found or not" (Wilks).

This yellow intra-vesicular mass is an intermediate stage of a diseased product which has undergone the metamorphosis known as "caseation-"tyromatous," a change not special, as "many consolidations, such as in-"spissated pus, old cancer masses, lymphatic glands enlarged by hyperplasia "of their cell elements, hæmorrhagic deposit, as well as the clear miliary "tubercle, may each and all become yellow and cheese-like, and quite inde-"pendent of the scrofulous diathesis"; equally also "all the morbid products "in the lungs of pneumonic origin" (Aitkin).

In this group of lung disorganization it has been set forth that the clinical phenomena of the early stage are those associated with inflammatory action, and when the early phase of the yellow caseous product can be traced *post-mortem*, it is shown as an intra-vesicular lobular mass, made up of cellular elements not to be differentiated from the products acknowledged pneumonic, and with gradations merging from the latter into the former. The site, physical, and anatomical details clearly separate it from any possible degraded condition of a miliary growth or growths, and it has been already pointed out that in 44 per cent. of these cases the absence of the miliary tubercle was decided. In a type specimen of pneumonic consumption the diseased products are cell forms amassed in the vesicular area of a lobule or lobules, with no marked departure of the lung stroma from the normal state; and it is asserted that as seen in the military lesions comprised under group 1 of consumption, the products are also essentially inflammatory in nature, that they become latent under caseation, that they interfere with the nutritive changes of the lung tissue in which they are situated, and that they ultimately are absorbed or cretify, or disintegrate and involve with themselves in a common destruction the tissue elements forming a cavern.

But, however, it has been shown that in a certain percentage of these *post-mortems* nucleated adenoid elements in the form of the miliary nodule were present—the inflammatory phthisical lung had become tubercular—and the question follows in what relation do they stand?

As regards the distribution of the miliary nodules it was noted that:—

(*a.*) In the examples of disease in which they were observed they bore no relation to the extent of destruction produced;

(*b.*) They were occasionally limited to one viscus, and that not necessarily the most advanced nor most extensively diseased;

(*c.*) They were rarely the accompaniments of exhausted morbid action—old latent cavities—nor as a rule with the early stage of hepatization or gelatinous infiltration (a feature opposing the origin of the inflammation and tubercle from the same source of irritation), nor did they affect the latent crude masses, but were associated with disintegrating elements and liquid diseased products;*

(*d.*) Their selected site was in the vicinity of a caseous mass undergoing liquefaction, or a bronchus distended with purulent or muco-purulent contents, especially if the tube had become dilated and formed into a receptacle cloaca,—here were the maximum favourable circumstances;

(*e.*) They radiated from these points as foci, forming a group around the cavity in process of production or the dilated bronchus, and arranged in a linear series when in conjunction with the uniform tubal distension;

* This is occasionally well seen in cases of empyema terminating fatally and complicated with miliary growth. In three examples the right pleural cavity was distended with sero-purulent fluid, and the membrane coated with an old thickened pyogenic tissue. On section of the lung tissue miliary growths formed isolated specks following the contour of the pleural surface; none were present in the opposite lung, nor in the body at large.

(*f.*) A normal fibrous septum of the lung occasionally formed a distinct boundary to their diffusion in one direction from the focus.

Turning to the tubercle itself, the all but invariable characteristics were—smallness, firmness, semi-transparency, rarely caseous, contrasting strongly as a new growth* to the old diseased textures with which they were conjoined. That they are not necessary to the extension of the morbid process is proved by their disconnection with the more recent disease, and their marked limitation to certain requisite degenerative changes, their pathological youthfulness of structure, determine these growths as secondary and incidental.

It is clear that the formation of these miliary tubercles is no necessary adjunct to the disintegrating process as evinced by the frequency of their absence, nor are they necessarily present with a pus distended tube or bronchial dilatation; on the other hand, they cannot fairly in these army cases be linked with a special constitutional state to determine their evolution, inasmuch as this cannot become temporary obsolete, and unquestionably the same disease phases without their development have been previously existent in most of those instances ultimately exemplifying tuberculosis; they are associated with advancing disease, liquefied morbid products, and considerable undermining of constitution; this much is certain, but what determines their production seems as much wrapped in mystery as the frequent immunity of an individual to noxious agencies, and his becoming victimized at a later period.

In a tuberculo-pneumonic lung the advocates for the inflammatory nature of this variety of phthisis would see in the cavern the mould in which was previously located the cheesy mass; in the cheesy mass the degenerate products of inflammation in the vesicles; and would regard the miliary growths diverging from the softening patch into healthy tissue as a dangerous complication, a production of tuberculosis not hitherto existent but produced by a process akin to infection. To presuppose the origin of the cavity and the crude masses in the retrogression of miliary tubercle is to assume that of which no substantive evidence exists in the viscus, there being nothing tangible from which to elicit the gradations of the one into the other. We rarely see the cheesy mass otherwise than as such, but should we have the opportunity of observing its early phase, it is presented to us as a semi-transparent somewhat gelatinous material occupying the site of the air vesicles, and in nature and anatomical details not to be differentiated from pneumonic products, the merging of the latter into the former in some instances of inflammatory lung lesion admitting of no doubt; on the other hand we just as rarely see the miliary tubercle otherwise than as it is usually described, both as to character and size, occasionally small cavities may be produced by its subsequent phases *per se*, yet seldom; the inflammatory nature of the crude mass is based on clinical details and pathological data, the independence of the latter of such process is generally acknowledged, hence in origin, in anatomical relations, in the naked eye and microscopic details, there are marked differentiating features, while the merging of the small miliary tubercle into the extensive crude nodule is wanting in proof. On the other hand, again, the frequent production of such a cavity and crude masses in lungs free of all miliary tubercle admits of no doubt;† hence, when we find these growths arranged, as admitted by Lennec, around the softened mass it is more in keeping with the characters they each possess, the clinical and pathological facts, to regard the true tubercle as secondary—as a complication due to a process of infection and allied in nature, in development, and in microscopic details to those generated artificially in animals by the production of a focus of degenerate products.

The local textural derangements of this group of phthisis are regarded as

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* This growth of structure in these nodules, as compared with the intra-vesicular deposits, is very marked in this group of lesions as well as the general absence of anything showing a gradation approaching disintegrative processes, and I believe the explanation to lie in this,—that these inflammatory phthises rapidly terminate fatally after becoming tubercular.

† Regarding the cavern origin in preceding miliary growth, how opposed to all ideas of constitutional diathesis are those residues as cicatrices, crude nodules, &c., discovered so frequently *post-mortem* in lungs of individuals not discerned during

inflammatory in nature,* and the diseased products as liable to become the foci of adenoid nodular infection.†

In the foregoing pages the miliary nodule complicating these varieties of phthisis has been depicted as small, liable to develope further inflammatory changes in the air vesicles, but generally rapidly fatal, and hence as observed *post mortem* made up of comparatively youthful textural elements. It is, however, the opinion of Dr. W. Fox and Dr. Powell that the nodule may undergo a fibrous transformation into a permanent texture, and the former observer would appear to hold that many cases of the so-called chronic pneumonia and the fibrous strands so often met with in tuberculated lungs are examples of such process, and that the possibility of such a termination is not sufficiently recognized.

One case I have met with which indicates that the miliary tubercle may, if limited to the lungs, become chronic, induce chronic developmental action in the stroma, and present features which at first sight fall into the category of the transformation described by Dr. Fox, yet apparently allowing of another explanation.

In this instance the association of fibrosis with the miliary growth was the main interesting feature, a combined adenoid and fibroid tissue development with no trace of conjoined intra-vesicular products. What was the relation? In the pulmonary parenchyma, except around the medium-sized bronchial tubes (the result of long continued bronchial irritation of the prodromal catarrh), there was no growth of fibroid tissue unaccompanied by small aggregated tubercles, while on the other hand more widely dispersed small nodules and some large crude ones were free from this material, indicating that while there was no necessary sequence of the fibrosis to the nodule, yet when associated some directing force was present, something more than mere coincidence. It was clear also that the miliary tubercle was primary to the subsequent cirrhotic phases. It will be observed (Plate 2, Fig. 11) that the fibre cells were dispersed wider in range in the surrounding tissue than the adenoid elements, and were seen when none of the latter could be traced or existed, also that whether observed in the nodule or its prolongation between the vesicles, the one structure was anatomically differentiated from the other, and no merging of the nuclear particle of the tubercle into the fibroid cell could be detected, the whole microscopic evidence negativing such an idea. Strands of fibroid tissue surrounded the miliary growth and passed into its substance, diminishing on ingress; the same appearance was observed in the older tubercles and also in the bronchial glands; the essential components of both were identical. From the foregoing details the conclusion is drawn that in this case the miliary tubercle had acted as a chronic irritant, and caused development of the lung skeleton within its vicinity, and also of its own delicate stroma, leading to induration of the pathological growth and cirrhosis of the lung. The case exemplified two phases of the miliary nodule—the one (seen in the larger variety), its caseation, disintegration, formation of a cavity, and a focus of secondary infection; the other (seen in the smaller growths) its abortion from induced fibroid strangulation; in neither instance was there any trace of intra-vesicular deposit, and the latter phase (interstitial inflammation) was chronic and limited to the lung stroma solely.

The evidence in this case corroborated the deductions from other examples—that *per se* the nuclear particle of the miliary tubercle showed no tendency to

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life, and in which beyond these relics of diseased action, long extinct, no corroborative points are elsewhere observed; and how facile, and in accordance with the observed facts on the explanation of a latent limited pneumonia!

* In Dr. C. T. Williams's *Civil Cases* 26½ per cent. were traced to inflammatory attacks.

† In most of these instances, in whatever light we regard the relation of the adenoid nodule to the lymphatic system, it is quite clear that the indubitable lymphatic textures of the lungs are in a state of intense irritation. Not only are the glands at the roots of the lungs enlarged, but along the bronchial tubes the same feature is apparent even to the ultimate ramifications where small glands, the size of an hempseed, normally invisible to the naked eye, are often to be met with; equally under the pleural membrane. Comparing microscopic section of these hyperplastic glands with sections of the miliary nodule the similarity of the one to the other is very marked, and strongly suggestive of a similarity in origin.

fibre development, and that when these two tissues were observed conjoined, the balance of evidence favoured the idea that the fibroid excess was due to engrafted sub-acute or chronic inflammatory action equally as observed elsewhere where no nodule could be advocated as a prior element of irritation or development.

After development by a process akin to infection we may assume that the miliary tubercle may be followed by the following phases, either in itself or in the pulmonary tissues :—

(*a.*) Having reached its development it may become latent or caseate, disintegrate, forming a cavity, and act as a secondary focus of dispersion ;

(*b.*) May, during an earlier period, originate cell growth within the vesicles, and by the induced inflammatory lesion lead to extensive and rapid disorganization ;*

(*c.*) Or may originate chronic changes in the lung stroma leading to its own induration and quiescence with cirrhotic results in the surrounding lung tissue.

In this group of lung destruction the bronchial glands were invariably enlarged ; occasionally melanotic, caseous, purulent, indurated, reduced to a cretaceous nodule, lardaceous.

Before, however, terminating the details of the local lesions in the lungs acknowledged as consumption during life, and classified as such, it is deemed necessary to say a few words on these examples of lung destruction not coming under the category of phthisis, and not recognized during life, but observed in the bodies of soldiers dying of other diseases, or accidentally killed. I refer to the limited pulmonary tissue disorganizations, apicial or otherwise in site, so frequent a feature in military necroscopical inquiries, and observed either as cicatrices with loss of substance, cretaceous masses, crude caseous nodules, or caverns. These circumscribed lung destructions present on a minor scale all the morbid anatomy details to be found in many of the cases of confirmed phthisis, they occur under like surrounding conditions and in the same class of individuals ; there can be no question as to their identity in nature and pathology with the recognized consumptive cases. Met with in the apices of pulmonary parenchyma diseased throughout, they are no uncommon feature in lungs otherwise healthy, of old date in origin and development, and compatible with most perfect general health and strength. The main interest lies in the explanation of their presence, and the light they throw upon the nature of the process of fatal lung destruction. That they are examples of limited phthisical pulmonary disease, requiring but a few repetitions to involve the whole viscus, cannot be questioned. To associate them with any inherent hereditary tendency would be to assume a concentration of the tubercular diathesis in the army strangely at variance with the body-type, the history, the dominant forms of disease, of the component sentient items of this class ; strangely at variance also, in their phases, with the pathological laws of undoubted constitutional diseased states. They are microcosms of fatal lung destruction, and give strong support to the prior inference, that the first group of army consumption is local, inflammatory in nature, and independent of diathesis inherited.

General Lesions.—Great wasting of the framework of the body was constant, the average weight of the entire dead organism being 94·6 lb.†

* Have we not an analogous process on the body surface in the instance of a suppurating bubo, or a suppurating caseous, strumous, gland !

† As expressive of such wasting, I append the following illustrating individual examples :—

Weight on Enlistment.	Post-mortem Weight.	Loss.	Weight on Enlistment.	Post-mortem Weight.	Loss.
st. lb.	st. lb.	lb.	st. lb.	st. lb.	lb.
9 4	6 7	39	10 6	6 8	54
12 0	6 5	79	10 10½	6 10	55½
9 6	6 6	42	12 6	6 2	88
9 12	6 5	49	10 0	5 10	60
11 2	6 10	62	11 1	8 1	42

Of the viscera a healthy structure was the rule, but irrespective of diseased states certain features were apparent as regards bulk, thus :—

Average weight of liver, 66¼ oz., as contrasted with normal average of same age and sex, 60·29 oz., giving an excess of 6 oz.; this viscus constituted $\frac{1}{25}$th part of body weight as contrasted with $\frac{1}{32}$nd normal adult relation as given by Frerichs; hence, actually, and more especially relatively, greatly in excess.

Average weight of spleen, 8·75 oz.; normal average, 7·19; hence an hypertrophy represented by 1·56 oz.; constituting $\frac{1}{210}$th of body weight against $\frac{1}{330}$th, $\frac{1}{400}$th normal health relation; actually and relatively in excess.

Average weight of kidneys combined, 12·11 oz.; normal average, 11·57; hence an augmentation of ·54; constituting $\frac{1}{150}$th of body weight against $\frac{1}{240}$th normal relation; actually and relatively in excess.

Average weight of heart, 9·11 oz.; normal, 10·06; hence a decrease of ·92; constituting $\frac{1}{166}$th of actual body weight against $\frac{1}{227}$th normal relation; actually a decrease, relatively an hypertrophy.

Average weight of brain, 51·79 oz.; normal, 47·9; an excess of 3·89; constituting $\frac{1}{28}$th of body weight against $\frac{1}{25}$th normal relation; actually and relatively in excess.

It is clear that the stress of the great wasting, so conspicuous a feature, and from which the disease derives its name, falls in no degree upon the solid viscera, but wholly upon the framework of the body, the muscles, bones, and fat atrophying, not apparently from any inherent defects, but simply from curtailment of nutrition. Following the functional incapacity of more or less of the lung membrane is blood impurity and hypertrophy of the depurating and purifying organs, the liver, kidneys, and spleen; the latent developmental power in these viscera is roused into activity to counteract the defects in the aerating viscus, and to restore the systemic balance surcharged with extra tissue waste. The attempt of nature is, as we know, too often brought to nought by the progressive lung disorganization; the intestinal canal shows complications, the hypertrophied viscera degenerate, nutrition is at an end, and the exhausted frame dies, not however without leaving behind in the relics the hopeful assurance that, provided we can control the local ravages, and prevent further involvement, the other viscera will by their inherent power of development make up by their excess for the deficiency of one member. When we remember that the details of these cases indicate a distinct destruction of the lung tissue step by step, and when we bear in mind how compatible partial and limited lesions are with good average health and strength, and that after the extension of the caseous mass, the tendency is to quiescence and healing of the wounded tissue; surely, in early diagnosis of the disease, and the removal of the individual from the generating conditions, we may with appropriate treatment bring to a natural end the first onslaught, prevent subsequent fresh attacks by careful hygienic measures, and yet leave the sufferer capable of the enjoyment of life, and a help, not a burthen, to his friends and the community at large. Pathology and morbid anatomy undoubtedly warrant such a deduction.

Intestinal Lesion.—The statistics point out this large tract of glandular elements as the most frequently deranged in sequence of the lung destruction, even more so than the miliary complication, ranging in extent from the tonsils with ulceration at one extremity to the peri-rectal abscess at the other. Slight ulceration, mamillation, or pigmental deposit in the mucous membrane of the stomach was not uncommon, but the chief seat of disease was the small intestine, in point of frequency—catarrhal congestion, in point of importance—ulceration with an origin in softening and disintegration of caseous matter in the solitary or Peyer's glands, and reaching an acme in the caput cæcum. These ulcers were various in size and extent, transverse, circular, or following the long diameter of the gut, according to their seat of origin, or whether single or formed by the coalescence of several points; generally sharp cut, with crude, small fragments of morbid material attached to their surfaces, or permeating the surrounding tissues; they often undermined the mucous membrane forming pouches, and, although generally indicating progress, yet the bevelled off and granulating appearance of the surface of some showed healing, which could also be discerned as completed in cicatrices. Attenuation of the intestinal coats, with atrophy of the mucous membrane, lardaceous disease of the villi or

small arteries, wasting of Peyer's patches, pigmental deposit, prominence of glands from accumulated contents, crude caseous changes in the same prior to disintegration, pigment spots, with contraction the site of the accomplished process of expulsion and healing, occasional sloughing and diphtheretic exudation on surface—all these might be noted separately or conjointly. These were rarely present without the adjunct of the catarrhal congestion, in patches or more uniformly dispersed, and especially conspicuous on the tips of the valvulæ conniventes; this surface derangement was the common morbid defect, and apparently the precursor of the more grave abnormalities of the gland system. The same phases of diseased action were observed in the large intestines, but of minor frequency; all these lesions progressed in intensity from the duodenum downwards and culminated in the caput cæcum.

To the solitary glands, or their aggregation in Peyer's patches, we must direct our attention for the elucidation of the phases of the more grave lesions of this tract. In the earliest stage, they are seen tumid and gorged with contents forming little gelatinous prominences of the mucous surface like "sago grains," and by their pressure displacing the tubular glands; microscopically these tumefactions are made up of granules and fine cells (nuclear particles?) enclosed by a condensed, limiting, connective tissue. They subsequently become opaque, and are often seen surmounted by a ring of vascularity with a matting of the textures in the vicinity, the which material becomes caseous equally with the gland contents forming white cheesy accretions in the mucous and submucous tissues. The glands may, however, before the implication of the surrounding textures, expel their contents and shrivel, leaving a thinning and pigment spot from blood extravasation as evidence of their former site; but most frequently they form small circular ulcers, which by circumferential spread and coalescence form the lesions with the features above mentioned. These ulcerations may go on to perforation of the gut, but the most frequent sequel of them is the production of miliary granules on their peritoneal aspect beneath the serous coat; these latter, equally here as in the lungs, are no necessary feature of the lesion, but are not uncommon with advanced disease in the gut, and this quite independent of their production in the lungs.

What is the relation of the intestinal to the lung disease?

Niemeyer regards the ulcers as having their origin in the breaking down of follicles which were previously enlarged by cell proliferation, and had undergone cheesy transformation;—"the enlargement of these lymphatic glands accompanies chronic catarrh of the intestines in the same way as the swelling of the cervical glands follow an eczematous eruption of the head or face." That they occasionally precede the lung lesion seems indubitably proven by one or two instances in which death from one or other cause occurred at an early period of the pulmonary disintegration, and in which cicatrices or cicatrizing ulcers attested the comparative anciency of the intestinal mischief. It is clear also that they are no necessary adjunct to consumption, but when present are connected as a rule with advanced disease. That the glandular irritation has, as a general precursor, catarrh of the mucous membrane seems supported by facts. It is not uncommon to find at the lower part of the ileum, ulcers with white cheesy particles adherent to their sides and bases, above this uniform catarrh for some distance with specks of blood pigment and glands filled with opaque material, in the jejunum patches of catarrh and gelatinous prominences, and nearer the duodenum mere catarrh. It is clear also that their origin is not generally through the medium of an infection and production of miliary tubercle from the lungs or elsewhere, as they are seen perfectly independent of such process. On the other hand, there are a few examples, in which, with the production of "general tuberculosis" these miliary growths may be seen as independent bodies scattered over the peritoneum, generally or mainly over the intestinal covering away from all local caseous deposits, clearly indicating a common dispersion from the lungs as a centre, and suggesting an occasional production of ulcers in the mucous membrane from them. The frequency, however, with which the intestinal lesion follows the lung disease, in point of time, shows some clear relation. "Catarrh of the gastro-intestinal "mucous membrane is by no means uncommon in pneumonia; in some in-"stances proceeds to a more serious stage by producing dysenteric ulcera-

"tion of the colon."* The association of the intestinal disease with pneumonia, has been also pointed out by Dr. Bristowe†; hence, with acute inflammatory lesions of the lungs, equally with the chronic ulceration, the surface derangement, passing on to deep and lasting textural changes, is a not uncommon complication. Ulcerations of a character not to be traced through the glandular phase, are occasionally observed in phthisis, either in the large or small intestine, and in the latter not centred in the caput cœcum, which, as a rule, is the point of departure of the gland complication, but decreasing rather from the duodenum downwards, and associated during life with great gastric disturbance, though no actual lesion in the stomach. It seems in accordance with facts to deduce the ulcers, as a rule, in the gland irritation, and these from a prodromal catarrh of the mucous membrane; the linking of the latter with the lung disease, the process of causation, is however far from clear. The function in health of the solitary and aggregate glands of the gut is far from decided, as also the caput cæcum the second pouch of the intestinal canal; organic and decomposing particles in water act as an irritant to the mucous membrane; the gland implication in dysentery and typhoid-fever is well known; stomach irritability during life is a strong symptom of the phthisis, and Laennec deduces the laryngeal mucous vascularity and lesions in the passage over it of the ejected lung disorganizing products; may not the catarrhal intestinal mucous membrane and gland irritation be traced to the passage over them of particles adhering to the common buccal and pharyngeal surfaces during expectoration, and subsequently swallowed?

The formation of the miliary growths on the peritoneal aspect of the ulcer is always secondary to it, not uncommonly absent, and when present in an individual case not necessarily conjoined with every ulcer, but always here associated with the older ones. It seems in unison with facts to conclude with Niemeyer that they originate by a process of infection from the caseous degeneration of the gland identical with those found around the softening mass in the lung tissue, and their arrangement on the peritoneal surface as anastomosing streaks and nodules radiating from the ulcer site clearly connect them with some normal vascular network, and probably the lymphatic.

As a corollary of the intestinal mischief is the gland enlargements in the mesentery, co-equal in textural changes and causation with the bronchial glands in the thorax.

General tuberculosis.—The presence of miliary tubercle in other organs and viscera is far from common in these cases, as exemplified in the small percentages, and when noted in one, generally present in the other components of the body also. Wherever found they invariably are alike in pathological elements as previously detailed in the lungs, and hence need no repetition here. They present the same features of nodular excrescences and cord-like strands emerging from the major masses in all organs and tissues. In the liver they rarely have a fibroid capsule; in the spleen invariably so, and markedly resemble an enlarged and morbidly deranged splenic corpuscle; in the former viscus generally associated with some degenerative phase of the organ, fatty, lardaceous, or fibroid. In the kidneys, they are observed seated either between the tubes of the cortex or pyramidal portion, or in the circumference of a malpighian tuft, or underneath the mucous membrane of the pelvis; under the former site generally conjoined with epithelial amassing in the tubes. They are rarely seen in these forms of inflammatory consumption otherwise than small and recent in growth, while in the true tubercular variety they are occasionally found as large as a bean. Under no conditions, however, have I observed them as presenting the features of an infiltration as compared with the circumscribed arrangement of the nodules. Adopting the theory of "infection," these must follow their prior generation in the lung tissue, and be produced by transferences of particles through the lymphatics or venous pulmonary system in the nature of embolism. The cause of their infrequency seems explained by Niemeyer, whose observations this group of phthisis fully supports—that "the production of these growths in the lung tissue from the "caseous mass, notified in the symptomatology by rapidly rising pyrexia and

* *Reynold's Medicine*, vol. iii., p. 680.
† *Path. Soc. Trans.*, vol. viii., p. 66.

"constitutional disturbance, out of all proportion to the spread of the disease "as capable of elucidation by the stethoscope, is soon fatal, and hence does not "allow of the necessary time for the frequent development of a general "'tuberculosis.'"

Cardiac and Vascular Lesions.—In point of frequency the serous sac is the one generally involved, consisting mainly of external adhesions to the lung surface, and internal adhesions between its visceral and parietal layers, occasionally obliteration of the sac, thickenings, ecchymosis, with irregular vascular patches in association with adjacent morbid action in the pulmonary tissue; all these apparently produced from tissue transference of contiguous diseased processes. In the heart, dilatation of the right ventricle and a thickening of its walls with an increased area of the pulmonary artery as compared with the other orifices was the more frequent divergence, in sequence to the opposed transit of blood through the aerating viscus; we have seen that as regards weight, this hollow muscle was the only organ below the normal bulk, and in this respect agreeing with the wasting of the muscular tissues generally, yet far from partaking with them in the same degree, as, relatively to the total body weight, the heart's substance was, equally with the other viscera, greatly in excess; the systemic half, with decreased blood to eject, was below normal, the respiratory half, with obstacles to overcome, was in excess, indicating, as with the solid organs, the same natural adaptability to the functional requirements of the body as a whole. The fibrinous clots of slow death were constant in the right side and passing into the pulmonary vessels, nodular deposits on the lappets of the mitral valve also were far from uncommon, as also slight atheroma of the aorta.

Head Lesions.—In these the tubercular arachnoid predominated—in a minor degree subarachnoid effusions, vascularity of the meninges, serum in the ventricles, softening of brain substance, congestion of the vessels of the cranial bones and diploë.

It does not seem within the province of this essay to enter into details on the accompanying degenerations embraced under lardaceous, cystic, and fatty; they are not special, and, with the exception of the fatty, more frequent with other diseased states than with "lung destructions"; they express rather general structural deteriorations, and with the notification of their occurrence with the "local pulmonary lesion" the matter is left.

Viewing these varieties of phthisis collectively, we have a local lesion of the pulmonary viscera, chronic in course and inflammatory in nature, which may pursue a progress towards death of the frame entirely uncomplicated, but generally with a group of textural derangements in other parts superadded and assisting thereto; liable to develope morbid growths in the lymphatic tissue of the textures locally and generally; liable to produce in the intestinal canal a phthisis or chronic tissue destruction passing through almost identical stages with itself; liable to involve the heart by local transfer of morbid action; liable to cause general degenerations in the viscera in associations with great blood poverty and probable impurity.

Intermediate Sub-group.

In this group I have arranged two varieties of lung disorganization. The process through which the pulmonary deterioration passes is inflammatory in both, in the one originating in the vesicles—pneumonic, in the other, in the tubes—bronchitic. They both are linked with a constitutional diathesis—syphilis, and the local lesion in the lung is associated with specific textural changes in other tissues. In essence, the phases through which the respiratory disease passes to disorganization are similar to those detailed in the preceding group, yet the nature of the agency and the systemic status are special; there are features also in the course of the disease which diverge from those characterising the inflammatory varieties of consumption due to external agencies, and which, with the specific taint, have led to these two varieties being classed separately as an intermediate sub-group. These features will be apparent as we proceed with the details of each variety.

Syphilitic Pneumonic variety of Lung Destruction.

The form of disease to which I have appended the above designation is not uncommon in the service. The main features are, the occurrence of consolidations (and when their prior history can be traced inflammatory in nature and development) in the lung textures in individuals with a clear syphilitic infection as evinced by the specific lesions prior to the pulmonary affection,—these consolidations undergoing the tyromatous metamorphosis, and passing through the objective and subjective symptoms of lung disorganization—phthisis, the *post-mortem* data however indicating no presence of gummatous nodules as local exciting agencies.

The frequent occurrence of phthisis in syphilitic subjects has been long remarked and regarded by some observers as having a relation of effect to cause, yet the nature of the relation, the significance of the lung lesion directly causing death to the prior systemic infection, and the explanation of the process, are certainly far from being on a satisfactory footing. The general expression is well summed up in the words of Dr. Wilks, "syphilitic patients "are prone to phthisis, my own observations are confirmed by others"; but the rationale of this tendency rarely meets with any attempt at elucidation. The summary of Dr. Moxon perhaps best expounds the presumed effects of syphilis in the lung; he remarks*:—

> (1st.) There are a few well authenticated instances of gumma occurring in the lungs, but these are always small, and as to their effect insignificant.
>
> (2nd.) A chronic white hepatization, with more or less induration, spreading usually from above downwards, occurs in the lungs of syphilitics. This condition is frequent in congenital syphilis. The white hepatization is liable to attacks of circumscribed gangrene producing cavities which give to the organ much of the appearance of ordinary phthisis.
>
> (3rd.) It is believed that syphilis exerts a qualifying influence on phthisis causing it to become fibroid, or, as some would say, syphilis is a cause of fibroid phthisis.

Dr. W. Fox, on the same subject, states "that the difficulty of the inquiry "lies in establishing any certain criteria by which the alterations of syphilis "can be distinguished from the changes produced either by simple inflam-"matory or the tubercular processes."†

From the above summary we may glean that the specific virus may stamp its existence in the pulmouary textures as,—(*a*) gummata; (*b*) pneumonia; (*c*) fibrosis. To these we must add, (*d*) a bronchial involvement equally potent for ulterior destructions; the phase, however, which most immediately concerns us under this heading, is the second—the pneumonic.

That the lungs of individuals specifically infected are exceptionally liable to pneumonia and disintegrative processes, as far at least as the army segment of the community is concerned, is amply borne out by the following table.

The result of an inquiry into 84 *post-mortems* in which syphilitic infection, either *per se* or accompanying other diseased states, was present, indicated,—(*a*) that in 10 or 11·8 per cent. the lungs were healthy, (*b*) that in 74 or 88·2 per cent. the lungs were either pneumonic or in a state of destructive disease. Of 17 of these cases in which syphilitic lesions, conjoined with other diseases producing death but not pulmonary, were present—(*c*) in 15 or 88·1 per cent. the lungs were pneumonic or in a state of destructive disease; (*d*) in 2 or 11·9 per cent. the lungs were normal. Of 67 of these cases in which there was a clear course between the impregnation and death as a resultant, either by lung disease or by specific diseases elsewhere; (*e*) in 8 or 11·8 per cent. the lungs were healthy; (*f*) in 19 or 28·3 per cent. the lungs were the seat of inflammatory lesions; (*g*) in 24 or 35·8 per cent. the lungs were the seat of inflammatory consumptive lesions; (*h*) in 16 or 23·8 per cent. the lungs were the seat of gummata or their caverns. Dr. D. Milroy, 30th Regiment,

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* *Path. Soc. Trans.*, vol. xxii., p. 40.

† *Reynolds' Medicine*, vol. iii., p. 792.

also states that in that regiment from 1857–61, home service, "out of 50 cases of phthisis evidence of deterioration by syphilis existed in no less than 43."*

The form of pneumonia supervening on syphilis is lobular though by a coalescence of numerous foci a semi-lobular aspect may be produced; it is markedly insidious, often not recognized ante-mortem, and seldom accompanied by the subjective signs of pneumonia however extensive may be the tissue involved; not uncommonly the working of the alæ nasi or inspiration leading to a chest examination and detection of consolidated parts. When we carefully examine a lung specifically affected with this lobular pneumonia the most striking naked eye features are,—the distinct limitation of the diseased strand; the variation in degree in the affected parts; the absence of all marked congestion, œdema, or swelling in the surrounding pulmonary tissues so conspicuous in acute changes. The seat of the consolidation is more frequently the upper or middle portions of the viscus, and far from unfrequently limited to one organ. The tissue is not diminished in firmness, and the colour varies from a pale liver to almost waxy-white, the latter interspersed among the former with portions intermediate in hue. The pale portions average about one-third inch in diameter, and are often arranged in a serpiginous manner among the less advanced disease, or even ramifying in crepitant normal parenchyma; it is evident that the lesion is lobular, very variable in dispersion, of different stages, and approaching chronic in character,—there is but little, if any, undue vascularity in connexion with it. Looking at these lobules with a hand lens, some of the component vesicles will be observed to project above the cut surface, others are uniform with it, others are depressed below the general level; the inter-vesicular textures are very prominent, there is a firm glistening aspect pervading all. The microscope shows vesicles swollen out with cell contents, others sparsely occupied, others empty, the fibrous framework decidedly in excess. The lesion affects the lung stroma and the air vesicle. This form of pneumonia is not the only one observable in constitutional syphilis; it is distinct from the more uniform acute inflammatory changes which not uncommonly usher in and determine death in the debilitated frames on slight exposure to external agencies; it is, however, far from uncommon and seems to accompany the evolution of the virus and is regarded as dependent on it; it is the form with which this variety of pulmonary consumption is linked as a sequel.†

As illustrative of this form of pneumonia, its termination in lung destruction, and merging into "crude, caseous, inflammatory masses," I append the following examples in which during the latter period of constitutional syphilis lung symptoms appeared and continued to death, thereto assisting.

(1.) Lower lobes of both lungs posteriorly are irregularly solidified.

(2.) Posterior consolidation of both lower lobes, the base of the right is as if infiltrated with caseous material, the corresponding portion of the left has the nodules in the form of granular masses filling the air vesicles of a part, or the whole of a lobule.

(3.) The left lung almost completely consolidated with interspersed pneumonic and crude deposits merging the one into the other. In the upper one-third is a cavity clearly formed by the mere ablation of a part of the solid textures. The right lung has small scattered pneumonic and caseous deposits.

(4.) The right lung is the seat of hepatization in the upper lobe

* *Army Medical Blue Book*, 1861, p. 423.

† Foerster, quoted by Dr. W. Fox, *Reynold's Medicine*, vol. iii., p. 796, states "that lobular vesicular broncho-pneumonia, either in a disseminate or confluent form, "is very common in the lungs of children affected with hereditary syphilis, and "dying shortly after birth"; the morbid anatomy—"excessive development of "epithelial cells, and of their derivates filling the vesicles"; "suppuration changes "may occur in these spots, and give rise to abscesses, or they (*i. e.*, the intra-vesicular "products) may be accompanied by thickening of the walls of the alveoli by growth "of fibrous tissue ultimately forming a hard, firm nodule, which may attain the size "of a walnut." As regards the fibroid induration, Virchow considers a cirrhotic process to be dependent on syphilis, common to the lungs and other viscera.

firm, greyish, and uniform, as though infiltrated with tubercle; the overlying pleura is covered with a layer of recent lymph. The bronchial glands at the root of the lung and following the bronchi of this portion are enlarged and softened; the left lung is healthy.

It seems therefore apparent that the lungs of syphilitics are extremely susceptible to changes of an inflammatory nature,* primary lobular,—that the seat of the pneumonia is variable, and that gradations from pure pneumonic products to their caseation and excavation with no vestige of intervening miliary growth may be unquestionably observed. The linking of the inflammatory action with the virus in the elucidation of causation is not so clear,—whether to regard the specific poison in the light of a direct exciting agency, or as producing a general textural deterioration of the body and consequent extra susceptibility to disease causation, in which the lungs, "the most delicate of all in conformation and structure" (Allbutt) are the most liable to suffer. Inasmuch as we see the unquestionable specific influence of the virus falling on the fibrous framework of the lung, and at first, or even throughout, limited to this or producing but little intra-vesicular growth or deposit, the tendency at first sight is to regard the virus agency in these vesicular inflammatory cases as strongly predisposing only, and not directly excitant, and this, the locality of the lesion, the clinical history of slight prior exposure and onset, and the *post-mortem* data of some few of the cases support and indicate as one mode in which syphilis may induce death through the lung viscera; on the other hand, we have clear evidence of the irritating nature of the virus on the epithelial and sub-epithelial structures of the skin, in the throat, larynx, and bronchi, and analogy would support a like probable action on the same constituents of the broncheoles and air vesicles leading to proliferation and accumulation of cell forms within the vesicular area;—the clinical history also of the major part of the cases connect the onset of the lung lesion not uncommonly with the evolution of the virus in the skin and mucous membrane lesions, and strongly tend to substantiate the direct dependence of this pneumonia on specific irritation—the prodrome of our present variety of lung destruction. In whatever light viewed, the intimate connection between the infection, the pneumonia, and lung destruction, cannot be doubted; and in reference to this variety of consumption, the impossibility of clearly depicting each link of the pathological chain cannot in the least degree detract from the importance of this specific factor, whether as agent or accomplice, in the production of an extensive mortality through lung disorganization. The tendency of the inflammatory lung products in these cases is rarely towards resolution; there is in these specifically deteriorated frames either a marked leaning towards rapid destruction by purulent formations or gangrene, or an inclination to temporary quiescence through caseation, for which metamorphosis the conditions observed in the cases are extremely favourable.

Turning, however, from a consideration of the prodrome and the revelations resulting therefrom, it is necessary to regard this lesion from the other end of the pathological chain, from the aspect of accomplished destruction of lung tissue,—the point at which it falls into the category of consumption and becomes classed under our present heading. The relative proportion of this variety in the army phthisis is represented by a percentage of 5·6, and a return to the summary given at page 331 will show that the specific virus favours an inflammatory rather than a specific growth involvement of the lung tissues terminating in pulmonary destruction in the ratio of 35·8 to 23·8. The cases comprising the variety have these features,—there is a clear history of systemic infection and evolution of the virus in its recognized forms prior to the lung lesion, there is an association of the latter with periods of activity of the poison, deaths through the changes wrought in the pulmonary tissues, and an absence of all specific growths in the lungs with specific lesions elsewhere, *post-mortem;* the local morbid anatomy is inflammatory.

There is no necessity to enter at length into the clinical details of these cases preceding the lung lesion, the evolution of the syphilitic virus receiving too much exposition in the service; prior to the setting in of the pulmonary

* "Syphilis displays itself under the varied forms of bronchitis, pneumonia, and "broncho-pneumonia."—*Munk.*

symptoms there are no features in the individual case which would warrant an anticipation of them. The onset of the consumption is, as a rule, decidedly insidious and obscure; indistinct and ill-defined thoracic symptoms direct the attention of the patient to some one or other parts of the chest which on stethoscopic examination is found to be hepatized; in other cases, however, in the minority, a greater activity of the inflammatory process clinically defines the transition of the pneumonic stage and the subsequent consolidation as clearly as the *post-mortem* data. No period of the syphilitic disease seems free from this tendency to consumption, and although its onset cannot be connected with any especial stage or linked with the involvement of any one class of structures, yet a not uncommon associate is some form of cutaneous or mucous lesion. Dr. Milroy, 30th Regiment, narrating his experience of pulmonary disease and syphilis, thus remarks the origin of the former, "as the first crop "of blotches were dying away signs of condensation at the apices of the lungs "were manifested; but in a large proportion the first intimation of such a "condition was given by the men requiring treatment for an attack of bronchial "inflammation or rheumatic pains."* The early stage of this form of consumption equally as in the sub-acute pneumonic form is unquestionably characterized by insiduousness and latency.

The upper lobes of the lung, as a rule, first show the signs of consolidation, though deviations from it are far more common in this variety than in the sub-acute pneumonic or catarrhal forms, and in this respect also is included the bi-lateral involvement. Following the consolidation is the stage of disintegration, with no special noteworthy feature, the duration of the case is in proportion to the extent of the lesion, the progress of the pulmonary disease does not present or appear to retard the involvement by the special poison of the other tissues and viscera; on the contrary they combine in the undermining of the bodily powers, and, as a resultant, this form of consumption rarely extends over any lengthened period as compared with the previous varieties, and rarely appears to follow any other course than one tending to dissolution.

Illustrative of the morbid anatomy of the pulmonary textures in this variety is the following example of the disease.

Extensive old pleuritic adhesions were present over the right lung. The thoracic glands were enlarged and melanotic. Occupying the centre of the right viscus was a large irregular cavity formed apparently by a coalesence of a number of small ones, the interior was crossed by fibroid trabeculæ and disintegrating caseous material formed the circumference which merged into firm indurated texture; elsewhere in the viscus were caseous masses, which assumed the aspect of small nodules, or as if irregularly infiltrated. In the upper part of the left lung the tissue was areolated from numerous small grouped cavities, varying in size from a bean to a walnut, the walls formed by disintegrating caseous material; the lower half was healthy.

In this instence six years had intervened between the infecting chancre and death. While under treatment for syphilitic rheumatism, nodes on tibiæ, and cachexia, the lung lesion commenced with cough, viscid expectoration, pain in right side, and other clear symptoms of pneumonia; the disintegration was not long delayed, and within nine months of the inflammatory attack, death resulted from exhaustion. At the necropsy there were observed specific lesions in the tonsils, liver and bones, lardaceous disease of the spleen and kidneys, ulcerations of the so-called tubercular character in the small intestines.

Features strongly conspicuous in this form of disease are:—the shortness of the period between the first thoracic symptom and death, the absence in the lungs of all evidence of long continued diseased action as in the two prior chronic varieties the caseous mass rarely being expelled, *in toto*, at the necropsy, the want of all general unison between the one viscus and another in degree, extent and site of disease. The pulmonary parenchyma reveals isolated or aggregated lobules of hepatization and caseous transformation undergoing the usual phase, with evidence of the inflammatory nature in the overlying pleura and in the bronchial glands. The apex is generally the seat of the most advanced disease, but by no means constant. Specific lesions are invariably observed as associated with the lung lesion, yet not necessarily to be found in the internal viscera; in this respect there is a marked difference as compared

* *Army Medical Blue Book*, 1871, p. 4.

with the pure syphilitic variety; the pneumonic form of consumption being an accompaniment generally of the early evolution of the virus—with the specific forms of skin and mucous membrane disease, with the poison as an agent of inflammation, while the gummatous form of consumption is linked generally with the later stage, with the period of structural growths and deteriorations in the internal organs. In the pathology of this variety we have two concurrent forms of diseased action in operation producing emaciation, cachexia, and death—the one acknowledged specific, the other allied to all the inflammatory vesicular forms of consumption.

The question may be raised,—is this variety of pulmonary consumption in any way more dependent on the syphilitic virus than this, that the latter induces a debilitated frame, which acts as a fostering bed for the inherent tubercular diathesis to germ in? The answer to this is mainly set forth in the remarks on the inflammatory varieties at pages 316-319; that there are no facts beyond the prevalence of lung disease in the army on which to base the hypothesis of a prior diathesis; that the historical summary of the cases gives no sanction to it, that the frames of the individuals prior to the onset are not in unison with that typical of the tubercular inheritance, and that the lesions expressive of the strumous constitution form but an insignificant fragment in the induction of sickness and death in the military segment of the community.

The question also may be asked,—Why these cases, inasmuch as they present the same local phase of diseased action as the other varieties of pneumonic phthisis are segregated into a variety apart? The reasons for so doing are:—

(*a.*) The absence of all indications towards lung lesion prior to the syphilitic infection, the subsequent onset during the evolution of the virus, and especially its not uncommon coincidence with the cutaneous and mucous membrane lesions;

(*b.*) The great susceptibility (at least in the army) of syphilitics to lobular pneumonias and lung consolidations of a caseous nature, the extra susceptibility of them to become victims of "lung destruction," and the morbid anatomy of this and allied forms which shows that the pneumonia and inflammatory tubercle (caseous mass) are but gradations of one process;

(*c.*) The divergencies in site of the lung destruction as compared with the other forms, the deviations in the course and phases of the lung lesion, and especially the gradational absence, so marked a feature in the chronic varieties.

The above peculiarities form the differentiating features of this variety,—its connection with a special diathesis, its features of origin, the variability in the portions of the lung tissue involved, its rapid course accompanied by the specific disease, its *post-mortem* association with the indications of the virus agency on the other textures of the frame; from its congener, the next variety, it is mainly separated by the locality of the inflammatory process in the pulmonary tissues, vesicular as contrasted with tubal, and from the pure syphilitic by the entire absence of all prior pathological nodules in the lungs as agencies of irritative processes.

Syphilitic Bronchitic Variety of Lung Destruction.

The main reasons advanced in the former heading for the separation of cases into a specific pneumonic form of consumption are equally applicable to the present variety, the surrounding conditions of the one being that of the other, the distinguishing feature being the prodrome, and in the present form having its seat in the smaller bronchial tubes. This variety is not conspicuous in numerical frequency as seen in the small percentage, and examples of it are wide spread and few.

The prominent clinical features are—that during the course of the syphilitic virus an involvement of the bronchial tubes ensues, that the lung lesion becomes chronic or is renewed, and that after a varying interval of tubal inflammation indications of consolidated pulmonary substance become apparent, which merge into the usual symptoms of phthisis.

The connection between the virus and the bronchial lesion is sometimes very

apparent, and the association of the latter with the cutaneous specific lesions has been the subject of many independent observers. Dr. Stokes regards the bronchitis as assuming an acute or chronic character, the former "analogous to "the bronchial irritation of the exanthemata," and "associated with" or "preceding a specific skin eruption;" the latter is looked upon by Munk as an inflammatory action transferred by gradual contiguous involvement from the larynx. Milroy, 30th Regiment, corroborates the mucous and cutaneous coincident morbid action, and notes the retrocession of the former in one instance ultimately phthisical on the complete evolution of the skin lesion; he considers the seat of the disease to be the minute bronchi "which become "blocked up by the pouring out of specific material." Professor Aitken also observes—"bronchial irritation with fever in many cases precedes the skin "lesions, and may disappear wholly or partially when the skin lesions are "established. On the other hand, if the syphilitic eruption suddenly dis-"appears, bronchitis may ensue. Walshe records well-marked instances of "this; and it is a circumstance to be looked for among soldiers who, having "recovered from a primary syphilitic sore, are apt to be exposed to the risk "of bronchitis when mounting guard soon after being discharged to duty. "Secondary symptoms and pulmonic lesions are then apt to date their com-"mencement."* Hence we may affirm that a form of bronchitis exists purely syphilitic, and "considering the intimate connection there is between the "mucous surface of the respiratory organs of the skin, and the proneness of the "throat (that part of the former membrane in which we can with most facility "observe any change) to become affected, we cannot wonder that syphilis "should frequently show the earliest indications of its presence in the system "by affecting the lining membrane of the bronchi, and pouring out of "material into the smaller tubes" (Milroy); it would also appear that syphilis may act as a predisposing influence, rendering the tubes doubly susceptible to the external agencies of disease.

But, however, it is not this stage of the process which immediately concerns us here, nor need we take into consideration those examples, which by "block-"ing up the smaller air tubes may simulate phthisis" (Milroy), or in which "the general symptoms of phthisis may supervene, and yet no tubercle in the "lung may be developed but chronic bronchitis remain persistent" (Aitken); it is the supervention of lobular consolidation on the long continued tubal lesion, and the breaking up of the amassed material causing destruction of the pulmonary tissues and the formation of caverns.

Private H. W., aged 32 years, contracted an indurated chancre, rapidly followed by specific erythematous rash and sore throat. During the evolution of the secondary symptoms, and notably the throat ulcerations, he suffered severely from acute capillary bronchitis, which, after subsidence, recurred and was followed by consolidation and rapid disintegration of the lung tissue. Within nine months from the second bronchial attack the consumption terminated life by gradual exhaustion. At the necropsy the body was thoroughly emaciated, the left tonsil was ulcerated, with vascularity and ulceration of the larynx and laryngeal surface of the epiglottis. Firm pleuritic adhesions existed on both sides with a slight quantity of fluid in the pleural cavities. The lungs did not collapse, their lobes were agglutinated and the substance generally consolidated. On section, a large irregular cavity existed in the left apex, and elsewhere throughout the whole viscus were small lobular masses of caseous material surrounded by densely consolidated lung substance; these nodules were in the early stage of disintegration. In the upper lobe of the right lung were a number of small exacavations and caseous masses in process of softening; in the middle lobe were isolated and aggregated masses, some of a greyish hue, and immediately beneath these were a very few miliary tubercles. The mucous membrane of the bronchial tubes was intensely injected, swollen, and coated with muco-purulent fluid; the larger ones in the left viscus were extensively ulcerated, the ulcers in some instances being very deep, and one had formed a communication with the large cavity in the apex. The lymphatic glands accompanying the bronchial tubes were enlarged and very indurated, and were connected with glands at the roots of the lungs in the same state.

In another example there was a history of infection and secondary symptoms

* *Army Medical Blue Book*, 1861, p. 436.

n which throat lesions of the pharynx and larynx were very prominent. A period of indistinct bronchial irritation and obscure pulmonary signs followed, ultimately terminating in consolidations of the upper half of the left lung and confirmed phthisis. After death, there were the remnants (cicatrices) of old disease in the upper portion of the respiratory tube, but in the lower part of the trachea were indurated ulcerations apparently specific and passing into the left bronchus and most of its subdivisions leading to the upper lobe. The tract of lung supplied by these air tubes was the seat of caseous consolidations and cavities which were limited to the one viscus, and in this, essentially to the strand of diseased bronchi. There could be no doubt in this case as to the lobular consolidations being secondary, and in sequence of the tubal ulcerations.

Hence, then, in these instances the connection of the bronchial lesion with the evolution of the specific virus in one or other of its forms, the merging of the former into consumptive phases, and the *post-mortem* details, warrant us in segregating such cases into a distinct variety, acknowledging a syphilitic origin and suggesting special therapeutical and preventive measures. This tubal form of specific consumption has a prodrome patent to all, and extending over a lengthened period as contrasted with the insidious early stage of the prior variety; in these respects the syphilitic varieties are in consonance with the allied forms of consumption acknowledging an external agency, the catarrhal and sub-acute pneumonia. But even when not producing actual direct lesion of the pulmonary textures, the influence of this enthetic poison in undermining the stability of the body generally, rendering it ultra-susceptible to external agencies, and furnishing the systemic status so favourable to caseation of inflammatory products, cannot be over estimated; and thus in whatever light viewed, whether direct or predisposing only, no divergence of opinion can exist on the subject of preventive measures.

We may sum up the differentiating features of this variety as—

(*a.*) The anterior systemic specific infection;

(*b.*) The engrafting on this of the bronchial lesion, generally coincident with the involvement of the cutaneous surface, or in sequence of laryngeal or pharyngeal ulceration;

(*c.*) The concurrent progress of the lung destruction and the specific diseases evolution, and the combined tendency towards dissolution;

(*d.*) The variable site of the pulmonary lesion *post-mortem*, the severe character of the bronchial affection and the lobular nature of the caseation, the accompanying evidence of syphilitic textural changes elsewhere.

Group II.

Syphilitic Gummatous Variety of Lung Destruction.

Whatever doubt may be cast on the inflammatory syphilitic forms in an etiological point of view, none can exist in reference to the present variety, which is based on the existence of specific fibroid growths in the lung stroma and their phases—constructive, terminating in degenerative; phases limited to the nodule, or associated with combined pneumonic products the result of irritation of the pathological neoplasm on the textures in its vicinity; in the latter event, the disease producing lung destruction and caverns equalling in extent those observed in the other varieties of pulmonary consumption.

The existence of gummata in the lungs, and their dependence on the syphilitic virus equally with the same growth elsewhere, has been substantiated by too numerous observers to admit of doubt; yet when we endeavour to gage their influence in the induction of disease and death from the opinions expressed, we shall find great fluctuations, but an unquestionable inclination of the majority to regard them as comparatively innocuous. One writer remarks—"The lungs are probably more frequently the seat of syphilitic deposits than "is generally believed, although the supervention of phthisis on syphilis is a "fact generally known. Owing to the difficulty of distinguishing between the "tuberculous deposit and that of syphilis in the lungs, Dr. Wilks adduces only "two cases, but he remarks that the syphilitic cachexia resembles that of "scrofula, and he leans to the view of some who think that the scrofulous

"diathesis is nothing more than a phase of hereditary syphilis."* The "insignificant effects of gumma in the lungs" are set forth by Dr. Moxon in the summary of syphilis† previously detailed, in which opinion also Dr. W. Fox‡ would appear to coincide; however, whatever may be the modifying influences in army life as compared to the civil population, certainly the *post-mortem* data and clinical experience among soldiers tend to the inference that the gummatous nodule has been decidedly underrated as a factor of lung destruction. The proportion of this form of consumption to the sum total of the army disease is given as 5·6 per cent., *i.e.*, that this percentage of phthisis is brought about by the development of gummata in the pulmonary textures; the relative frequency with which gummata are observed in the lungs of those dying of syphilis, or of slight alien diseases engrafted on severely specifically deteriorated frames is expressed as a percentage of 31;§ while in a given number of cases, in which severe syphilitic impregnation was present, and in which death resulted either from lung disease, or it combined with specific disease in the viscera elsewhere, gummata and their caverns were existent to the extent of 23·8 per cent. Thus, in whatever direction we view these growths, whether from the point of death resulting from the destruction wrought in the pulmonary textures, and so classed as phthisis; from their relative frequency in deaths from syphilis in all forms; or from their proportionate occurrence in deaths from specific lesions and lung destruction ensuing on virus impregnation, it seems impossible to withstand the conviction that the sequence of their development is not uncommonly a series of morbid processes, productive of textural disorganization of a severe character often incompatible with life.

Should an opportunity be offered of observing the early stage of the nodule, we find the deposit or growth as specks and streaks of a glutinous material thickly studding limited districts of the pulmonary parenchyma, and giving the same naked eye and microscopic characters as gummata elsewhere; the site of it is the lung skeleton, the fibrous tissue between the lobules and lobulettes. By gradual increase and coalescence these multiple centres form a nodule varying in size from a pea to a walnut or larger, of an uniform firm opaque whitish aspect, often angular in outline, and clearly delineated by a dark thin rim of colour from the surrounding lung tissue, which with the occasional exception of being condensed by pressure from the proliferating nodule is at first, or even throughout, perfectly normal to the naked eye.‖ The histological elements of the gummatous growth are so-called cellular, occasionally ovoidal merging by elongation into oat-shapen or spindle-shapen structures; they are very delicate in aspect, with a single or double nucleus, and average $\frac{1}{3500}$th of an inch in diameter; where rapidly growing the nucleated protoplasmic particles tend to spheroidal, where advanced in growth they approximate in character the ordinary fibroid tissue cell (Plate 2, fig. 10). In the early period of the nodule these particles are seen arranged in two forms, either in concentric laminæ forming a spherical tumour mass, or as strands passing between the air vesicles, and not to be differentiated from the lung skeleton; in fact, the inference is that the nodule is due to limited localized hyperplasia of the nuclear particles of the fibroid tissue. But although in the youth of the gumma all changes appear to be connected with the inter-vesicular structures of the lung, yet it is clear that in the majority of cases the proliferation of the stroma does not continue for any lengthened period without being accompanied by corresponding action in the air vesicles of more or less of the embraced parenchyma. The outline of many of the vesicles are rendered merely irregular from external compression, but the interior of others is partially or completely filled with large epithelium-like cells. Beyond, but in the vicinity of the growth, the air cells are either normal or not uncommonly dilated. The tissue surrounding the nodule is all but invariably deeply pigmented, forming a frame, as it were, to the growth. When the original foci have coalesced, and the gumma has arrived at maturity, then in the firm fibroid composite mass we shall find

* *Med. Chir. Review*, 1864, July, p. 78, critique of Guy's Hospital Reports.
† *Path. Soc. Trans.*, vol. xxii., p. 40.
‡ Article, "Syphilitic Lesions of the Lungs," *Reynolds' Medicine*, vol. iii.
§ *Blue Book for* 1870, p. 384.
‖ *Vide* Plate 2, figs. 8 and 9.

obliterated broncheoles and vessels, innumerable fibroid tissue cells, air vesicles with large cell contents, collapsed vesicles, and patches of deep pigment.

The subsequent phases of the nodule, when uncomplicated by morbid action in the surrounding parenchyma, consist in quiescence and permanency; caseation when it loses its firmness and becomes friable like putty; softening through fatty degeneration when it becomes yellow and semi-liquid; in either of the two latter metamorphoses expulsion of the detritus may ensue leaving a cavity, or it may be absorbed leaving a fibroid cicatrix in its site with a puckering and falling in of the surface contour of the viscus, coinciding with the same phase so frequently observed in the liver; in these three aspects, interfering but little with the physiological work of the viscus, fairly coming under the designation of "harmless," and leading to no result beyond a blotting out of a portion of the normal textures equal to itself in size. Illustrations of such lesion in soldiers are given by Professor Aitken in the paper* previously referred to.

These gummatous growths generally form towards the periphery of the viscus, and as a rule are not solitary. They affect no particular exclusive portion of the organ, and although occasionally presenting bilateral symmetry, yet this feature is far from prevailing under the general virus agency; thus, taking 11 examples:—

(*a.*) In 3 they were limited to one viscus, the right, and then implicating—in 1 the apex only, in 1 the base, in 1 equally dispersed;

(*b.*) In 3 bilateral instances the apex of one viscus and the base of the opposite viscus were the seats;

(*c.*) In 2 the bases of the two viscera were involved;

(*d.*) In 1 the apices were implicated only;

(*e.*) In 2 instances only, in which a contrast between one portion and another could be instituted as to priority of origin, were the apices in a more advanced state than the bases; the maximum of these combined instances corroborating the statement of Professor Aitken, that the base exemplifies regional selection.

As regards the period of the virus agency in the body characterized by the lung involvement through nodular growths, it is clear that the gummata may be met with within sixteen months of inoculation; yet the majority of cases illustrate a far more remote interval, and, as far as I have been able to extend the inquiry, are invariably associated with like lesions in the organs or viscera some one or other, connected with the so-called "tertiary lesions." On this point the *post-mortem* data tend to link this variety of consumption with the evolution of the virus in the internal viscera as compared with the inflammatory forms, which, clinically, are generally associated with the skin and mucous lesions, with the virus activity as an agent of surface-irritation and inflammation, and present after death a freedom from growth in the internal organs, as a rule.

That these gummata may exist† and pursue the course above detailed without producing marked objective or subjective clinical features, leaving a small cavity or fibroid cicatrix as *reliquiæ* of extinct action, is fully borne out by experience, and were this all the subject might be here dismissed; but it is equally clear that the innocuous nature of the mass, so long at the changes are limited to itself, departs when the nodule acts as an irritant to the parenchyma by which it is surrounded, or as a focus of adenoid infection while softening and disintegrating. Under the former phase we meet with a mass of hepatized caseous tissue (intra-vesicular changes), or the same with dense fibrous bands conjoined, according as the stress of inflammation is thrown on the lung stroma or air-vesicles as a maximum, radiating from and embracing the gummatous growth, and often interspersed with partially emphysematous lobules; the caverns, on disintegration of the combined morbid products, equalling in size the average of the inflammatory forms of pulmonary consumption. Under the latter phase we observe the miliary tubercles ranged, as elsewhere, around the point of dispersion. As examples are the following:—

In the apex of the right lung were firm opaque fibroid nodules; in the base was a semi-liquid collection, all but an abscess, encircling a dense mass (fibrous

* *Army Medical Blue Book*, 1861, pp. 443–451.

† For examples, *see* "Collected Cases of Syphilis," Nos. 3, 4, 9, 12, 14, 15, 18, 22, 23, 32, and 36, *Army Medical Blue Book*, 1870, p. 381.

tissue nodule), the inference being that the active inflammatory changes were dependent on a softening gummatous growth. In the left lung firm growths were present in the upper lobe, and a large one adjacent to the posterior surface of the lower lobe was accompanied by softening and puckering, with contraction and falling-in of the overlying pleura.

In a case of tertiary syphilis at Netley (after death), in the right lung two patches of pleural adhesions were noted over the base of the viscus, corresponding to two large gummatous tumours; the tissue around them was consolidated and passing into caseation.

Speaking of the occurrence of gummatous nodules in various stages of growth and degeneration associated with the miliary growth of tubercle, Professor Aitken observes:—"In such cases the history of events in the illnesses "of the patient may be found to correspond more or less closely with the "appearances seen in the lungs—appearances which distinctly indicate the "formation of lesions commenced at different dates—appearances which denote "the occurrence of lesions in crops, or as a succession of events which may be "illustrated by the history of the symptoms during life, or of the illnesses "from which the soldier may have suffered."*

It is under these latter aspects that, in reference to phthisis, the lung gummata mainly concern us, the formation of engrafted consolidations terminating in excavations incompatible with life, and the evolution of the miliary tubercle. The former is traced through a superadded vesicular or interstitial sub-acute inflammation, and may be followed by the same train of intestinal and sequential lesions as the other varieties of pulmonary consumption; these and the specific deteriorations running side by side, but clearly differentiated the one from the other. There are good grounds for believing that this form of consumption is comparatively less fatal. Contrasted also with the pneumonic and bronchitic varieties of syphilitic consumption, the specific growth form is favourable on the score of mortality, partly accounted for by the limited comparative range of tissue involved in the latter, and probably partly due to this—that the individual exemplifying the pure syphilitic variety has steered through the early dangers, and has shown a constitutional capacity of resistance against the virus lesions (whether from minor potency of inoculation or inherent force of vitality) which carries him through the lung involvement also, and through which test the inflammatory exemplifications have not passed, these varieties being rather connected with the earlier stages of syphilis and its period of greatest general activity as compared with the ulterior localized deteriorations of the later stages of the virus.

The main clinical features of this variety are—the long anterior chain of specific disease prior to the thoracic symptoms, and the extremely variable site and extent of the diseased lung textures; the course of the disintegration and the accompanying pyrexia and the hectic are common to all forms. The *post-mortem* details of the cases regarded as phthisis, and included under that nomenclature during life, are but exaggerated pictures of the examples hitherto recorded as observed in the lungs of those coming under the category of syphilis proper. The extent of observed lesion is various, involving one or both lungs—now limited to the apex, now to the base, the base showing an ascendency over the apex or the apex over the base—all the diseased action being referable to one age or showing distinct gradations of involvement. It is true that in the lungs we may often find cavities which present no differentiating points from those observed in the other varieties of consumption; but it is rare that in the same viscus we cannot evolve the stages through which the disease has passed to excavation—in the isolated node, the node surrounded by hepatized tissue, the node forming the centre of a caseous softening patch. For example: in the apex of the left lung was a large cavity, smooth, with distinct firm lining membrane. Immediately beneath it was a large caseous mass, almost diffluent, in process of rapid elimination, the circumference being much softer than the centre, which was still of a bluish-grey colour and firm consistence (gummatous nodule). In the lower lobe was caseous material, as though infiltrated from the bronchi; and interspersed were nodules almost cartilagious, and surrounded by a dark thin rim of pigmentation: this infiltrated portion was friable. The upper and middle lobes of the right lung were healthy; the lower lobe corre-

* *Army Medical Blue Book*, p. 426.

sponded in character to that of the left viscus. The bronchial glands are invariably enlarged, and often indurated and melanotic. Not uncommonly is specific ulceration noted in the larynx, and occasionally ulcers of the trachea or bronchi, which, with their surrounding induration and comparative absence of vascularity, highly suggest a syphilitic origin. In the other viscera and tissues of the body are invariably to be observed marked evidence of the virus influence; and the surface, with its cutaneous cicatrices of ulceration and eruptions, the glandular indurations, emaciation, and earthy cachetic aspect, no less depict the agency hitherto in operation. Associated with the specific lesions may be others, such as the intestinal ulceration and swollen solitary glands, the miliary growth in the pulmonary tissues or more widely diffused, in sequence to the disintegrating products in the lungs equally as in the other varieties. With reference to the ascribed influence of the syphilitic poison on the fibroid tissues generally in the production of general fibrosis, I can find no corroborative data in these instances of lung disorganization. With all the gummatous nodules in the pulmonary parenchyma there is associated hypertrophy of the fibrous tissue elements to a greater or less extent, yet invariably this induration is limited to the periphery of the growths, in some forming only an encircling wall, in others more widely dispersed, in none, however, to such an extent as to justify the appellation of general. Inasmuch as the formation of the nodules apparently ensues through a circumscribed proliferation of the fibroid elements, by analogy we might infer a like action on the same elements generally, and this is borne out by the observed lesions in the liver occasionally, and kidneys especially; but, so far as I have been able to ascertain, this feature of the virus does not pertain to the lungs except in a localized sense. The associated general condition of syphilis *par excellence* is that known as lardaceous disease, as compared to which the fibrous is exceptional.

We may sum up the main features of this form of consumption as—

(*a.*) Inoculation with the syphilitic virus and a long train of anterior specific lesion.

(*b.*) Onset of the lung symptoms at a late stage of the poison evolution, generally at a time when other viscera also are showing signs of deterioration.

(*c.*) Extreme variability of the site of the pulmonary mischief, more commonly towards the base than the apex, involving one or both viscera, occasionally indicating gradations of diseased action during life.

(*d.*) *Post-mortem* data: presence of gummata; inflammatory caseated products grouped around them as foci; associated specific lesions in the textures and organs of the body generally.

But before closing this heading it seems best, at this point, to make a few remarks on a subject which concerns this and the following form of consumption, a subject mentioned in the early portion of this chapter—the difficulty of distinguishing between the miliary nodule and that of syphilis in the lungs. While somewhat diffident in the expression of an opinion at variance with observers of high authority, I cannot but think that there are features special which differentiate the one growth from the other, and which, when conjoined with the body status, remove the cases in question from the region of doubt. With the inflammatory tubercle—the intra-vesicular diseased products—there is but little probability of collision microscopically; but with the miliary growth, occupying the same anatomical site, there are grounds for a careful scrutiny. Under the microscope, the component elements of both are small and often of the same size; yet the particles of the node are decidedly and unmistakably so-called cellular, with a clearly-defined outline and nucleus, and a marked tendency (more or less pronounced according to age) to elongation and the formation of spindle-shaped forms. On the other hand, the adenoid particles do not give the idea of a cell, but resemble a glutinous mass with a variable outline, generally ovoidal, but irregular, as if from compression by contiguous particles. A darker central portion is seen, which by acetic acid is resolved into a nucleus. There is no tendency apparent to elongation, the one particle resembles the other. When amassed the particles of the one (syphilitic nodule) are observed to merge into the fibrous tissue elements of the normal textures. The particles of the miliary tubercle are to be noted side-by-side with the fibre strands, but clearly differentiated. Turning to the naked-eye features, the soft glutinous specks studding the limited site of the early node

and merging into the surrounding tissues are far removed from the firm, distinctly-circumscribed, grey kernel of the adenoid growth; while at a later period the irregularly-shapen, firm, white fibroid nodule—generally multiple, yet seldom numerous, variable in size from a pea or smaller to a walnut or even larger, showing no necessary discoloration from fatty degeneration in proportion to size or age, and generally encircled by the deeply pigmented ring of tissue—is opposed to the numerous spherical miliary tubercle, rarely advancing beyond a pea in size, always retaining its circular outline, and generally showing signs of softening before reaching the dimensions named or associated with products of intercurrent diseased action. As a supplement to these anatomical features is the indirect evidence of the relation to site, and other diseased products in the lungs, of conjoined disease in other viscera, and the associated conditions under which the pathological growth originated, tending to remove difficulties of proper classification. When these growths become commingled with the products of superadded inflammatory lesion, the difficulties of differentiating the combined mass into its constituents, and these into their proper spheres of causation, may be impossible; yet, so far as I have been able to extend the inquiry, it is rare that we cannot meet in a viscus thus diseased portions in their original uncomplicated structural entirety which serve as a clue to the coalesced products elsewhere, and upon which may be fairly based the phases of action through which the oldest disease has passed. The difficulty of describing in words (and conveying the same idea to the mind of another) minor visual characteristics under the microscope which tend to separate one element from another roughly approximating at first sight, is well known to those who work much at the subject, and it is more especially on such points that the protoplasmic particles of the gummatous growth contrasts markedly with the nuclear particles of the adenoid nodule. Plate 1, fig. 4, and Plate 2, figs. 2, 4, 8, 9, 10, 12, will assist in rendering the foregoing remarks more lucid.

Tubercular variety of Lung Destruction.

Under this heading I have classed those examples of pulmonary consumption in which the presence of the miliary nodule as a primary element was authenticated, and in which the disintegration followed changes in the growth solely, or in the conjoined products of surrounding morbid action. In point of frequency this variety is far from common in the army, playing but a minor degree of importance in the extensive loss from this family of diseases. As far as I have extended the inquiry, the tubercular form is essentially secondary,* that is, that the lung lesion is preceded by some chronic disease in the frame elsewhere than the pulmonary tissues, and from which it presumably originates, the nature of the chronic malady as a rule coming under the category of "strumous." I can find no illustration of a general dispersion and development of miliary nodules in the lungs, preceding and directing ulterior changes terminating in disorganization, in which there was not a prior stage of caseous degeneration accompanying chronic inflammatory changes, and capable of acting as a focus of adenoid infection. In so stating, I am far from denying the possibility of an original morbid outgrowth of the lymphatic tissue of the lungs, without the adjunct of disease elsewhere in that systemic condition known as strumous or tuberculous in which great activity (very liable to pass beyond health limits) of the lymphatic system and excess of the white corpuscular elements of the blood are prominent features; the intention here is merely to record that all the army examples of tuberculosis I have met with, clear and decisive and admitting of no doubt, have, without exception, an anterior history of ill-health dependent on, and associated with, chronic textural lesions.

In the majority of the examples of this variety the seat of the prodromal disease was the cancellated bone structures, the bodies of the vertebræ or small

* On this point Dr. Powell, in the *Medical Times and Gazette*, June 10th, 1871, p. 657, remarks:—"The tendency of modern research is certainly to show that "tubercle is much more commonly a secondary disease than has until lately been "suspected; that people are in fact only very exceptionally, if ever, born to die of "tuberculosis. A due appreciation of these doctrines, so different from that even "now accepted by many, is of almost national importance in giving encouragement "to those hygienic and other means of prevention the neglect of which has too often "been sanctioned by a foregone conclusion."

bones of the extremities (carpal or tarsal), the sacrum or temporal bones; occasionally large purulent collections unconnected with osteal disease were the precursors; in all there was a long continued existence of pus, or disintegrating chronic inflammatory products, as possible agencies of general deterioration of the system, or special infection and development of pathological growths.

The condition of the system accompanying the chronic disease was not uniform, in some—and this the majority—the configuration of the body and the history of prior illnesses justified their classification as strumous or tubercular; in others, the bone lesion owed an apparently specific origin—syphilis; in others again there was no traceable connection between the local lesion and any antecedent phase; and in some there was a marked tendency to a general glandular enlargement in connection with the miliary development in the viscera.

The clinical history of these cases presents the same features: a local chronic affection, with suppuration and general sytemic deterioration, followed, after a variable period, by the supervention of lung lesion, with great pyrexia, dyspnœa, and impaired respiratory functions disproportionate to the accompanying consolidation of the viscera as ascertained by the stethoscope and percussion, and rapid progress towards dissolution as the combined result.

For example,—in one instance, we observe in sequence of cheesy material in the bodies of the vertebræ, enlargement of the glands leading from it, dispersion of miliary growths to the peritoneum, lungs, kidneys, brain meninges; as regards the pulmonary viscera, we note these nodules as universally dispersed, embraced by inflammatory deposits or œdematous tissue or independent of all ulterior changes; disconnected with all arrangement to the softening mass, as in the first group of consumption, but on the contrary preceding the ulterior results and determining them.

As seen around the caseous material in the majority of instances of inflammatory phthisis, so equally with the same deposit elsewhere in the forms of lesions preceding this variety of consumption, there is no necessary development of sequential miliary growths,—disease, in this respect, coinciding with the artificial inoculation of animals, all foci not being followed by adenoid hyperplasia; equally also in cases terminating fatally, the lungs may be perfectly healthy in spite of the factors (so far as we are able to discriminate) for the lymphatic infection being in full force. That which determines the evolution of the miliary tubercle from the degenerate disintegrating products in tubercular consumption is far from apparent. Given the requisite nidus, chronicity is necessary, and also apparently constitutional instability, but beyond this all attempt at deductions seems mere conjecture; unquestionably all the examples do not come within the limits of predisposition hereditarily transmitted or constitutional type of structure. Following the development of miliary growths from the focal point, the first of the viscera, generally speaking, to exemplify their presence is the double organ, the lungs, and thus anatomically supporting the theory of origin through venous or lymphatic infection, and transference of inoculating material from the right heart. For example,—in a case of caries and suppurative action in the pelvic bones, terminating fatally by hectic and exhaustion, without any *ante-mortem* evidence of visceral implication, there were seen after death miliary growths dispersed throughout the upper lobe of each lung, surrounded by œdema and hyper-vascular tissues, none elsewhere, nor accompanying disease of any kind in the body beyond the local bone destruction in the pelvis. The development, however, of the miliary growths in the lungs does not necessarily commence in the apices, nor need the destruction of tissue subsequently culminate there.

In this variety of pulmonary consumption the lesions observed in the dead body are numerous and widespread, to be classed under—(*a*) precursory chronic disintegrative disease; (*b*) miliary nodule and its phases; (*c*) general textural deterioration. The first is variable in origin and nature, constant only in the production of disintegrative and suppurative products. The miliary growth is essential, in some instances not to be traced beyond the lungs; but in the majority, more widely diffused, and implicating other viscera and the serous membranes of the cavities; the nodules either *isolated, seated in the* tissues with healthy texture surrounding them, and pursuing their course as independent structures, or *as* forming the centres of inflammatory changes. We observe them in the brain meninges, either *per se* or accompanied by vas-

cularity and engorgement of vessels, opacities, adhesions, serous accumulations, œdema of surrounding textures, and the results of pressure on the contained viscus; equally also in the corresponding histological membranes of the abdomen and thorax. In the lungs we see them constant, generally dispersed, and seated in each viscus; as connected with the extensively diseased portions, and also permeating the normal crepitant parts; as isolated growths, surrounded by vascular and œdematous tissues, hepatized portions, or caseated products; firm and translucent, or opaque and yellow. Their site in the pulmonary textures and their pathological elements have been previously detailed (p. 321). They are intimately bound up with the inflammatory intra-vesicular products present, and they have an anatomical relation to these in every stage of the process which substantiates them as primary and originating the ulterior lesion; not merely studding the circumference of a disintegrating caseous mass, but forming a component of all diseased structure present. In the viscus we invariably find bronchial inflammation and its products in the tubes, pleural adhesions or fluid contents, hyperplastic or degenerative changes in the bronchial glands. We may observe more advanced structural disorganization in one portion of the viscus over the other, but invariably the diseased action merges from the isolated tubercle to the excavation. There is no defined gradational involvements, as in the chronic forms of consumption; not uncommonly the entire lesion is of one age, and there is a constant predominance of the engorgement and inflammation of the early period over the accomplished tissue destruction. The lung disease is rapid in its course, and often exemplifies acute phthisis. The tubercle may pursue an uninterrupted progress of degeneration unaccompanied by changes beyond the limits of the growth itself,* but generally vesicular, and broncheolar inflammation is engrafted on it, the phases in the products occupying the alveoli playing a major part in the visceral disorganization. Under this phase the mass of texture disease is the result of two processes; as elsewhere observed,† "in a lung where tubercle is rapidly "developing the epithelial cells of the alveoli may be also seen in a state of "active hyperplastic change, but after a time the elements become so crowded "and compressed at the centre that it is no longer possible to mark the limit "which separates the small cells of the proliferating connective tissue" (*i.e.*, on the assumption that tubercle originates in the connective tissue elements) "from the larger cells of proliferating epithelium; the two seem to coalesce." The identity of structure of the miliary tubercle under every condition of origin, its constant site in the lymphatico-cellular tissues, its clearly-defined naked-eye outline, its phases of growth, its disconnection with active stages of inflammation except as a precursor of it, its phases of maturity and degeneration, and accompanying diseased action, place it as a true pathological growth originating in normal textural elements morbidly hyperplastic, and independent of the active inflammatory products in the air-cells.

When occupying other viscera in this variety of consumption we note the miliary growths in site following the same histological elements as in the lungs, but rarely unconnected with general deterioration of the parenchyma—lardaceous, fatty, or fibroid. The kidneys, next to the lungs, are most frequently implicated.

The position of the miliary nodule to the proliferating epithelium in the air vesicles, as determining it, and not due to the same agency of irritation and ensuing at the same pathological period of time, has been regarded as borne out by the observed details of these cases. In the majority of instances the capability of the nodule to determine ulterior morbid phases in the surrounding tissues is exemplified within the air vesicle, but occasionally it would appear that the major stress is thrown upon the lung stroma, and, but in a secondary degree, upon the parenchyma. As exemplifying this, I append the following details of a case.

The lungs were generally congested, and miliary nodules were universally dispersed throughout the viscera. Surrounding the majority of the nodules was a zone or ring of very vascular tissue, from one to three lines in depth, the vivid redness of the hyperæmia markedly contrasting with the pallid opacity of the central growth, and in a minor degree with the surrounding

* *Medical Times and Gazette*, 1872, p. 267. By Dr. Moxon.

† "Observations on Tubercle," *Med. Chir. Review*, 1860, July, p. 40.

parenchyma. In a few instances the circumscribed hyperæmia had passed into pneumonia, but in either conditions illustrating the influence of the nodule as a focus of irritation. Scattered also throughout the lungs were masses of consolidation, white, opaque, and firm, varying from one to three lines in diameter, some firmer than others and almost cartilaginous in feel and appearance. The majority were circular or oval, with irregular projections passing into the surrounding tissue; not uncommonly the centre of the nodule was a small blood-vessel, or capillary bronchial tube, or if the vessel were not in the centre, then it was closely contiguous to it externally, or near the circumference within the limit of the growth. After placing the lung tissue in spirit and washing, these nodules strongly projected above the surface of the surrounding tissue. Under the microscope these nodules consisted of the following elements—spherical or oval miliary growths not uncommonly well mapped off by a dark pigmental deposit around the circumference; extensive strands of fibroid tissue permeating the mass and passing beyond it into apparently healthy parenchyma; air-cells empty and collapsed, or with epithelial contents more or less occluding them. Occasionally, when the blood-vessel or tube could be seen with the naked eye occupying the centre of the growth, it might be detected with the microscope blocked up with a fibrinous mass, and always surrounded by thickened fibroid tissue. The main feature was the extensive hypertrophy of the stroma around the miliary nodules, which were regarded as determinig it.

Instead of the general scattered arrangement of the miliary nodules, in some instances they are grouped together in racemose masses, greatly resembling a lobule with infiltrated air-vesicles. On minute examination the nodules are seen to be clustered around a capillary bronchus, or lobular blood-vessel, with associated epithelial accumulation in more or less of the air-vesicles connected with the implicated tube.

The dominant form of general deterioration in this variety of consumption is visceral lardaceous disease—in the intestinal coats, the liver, spleen, and kidneys; considering the short duration of the lung lesion in these cases, it is more in consonance with the facts of general pathology to regard this textural lesion, common to many viscera, as dependent on the chronic precursory disease and its long continued suppurative process. The kidneys are rarely healthy, relatively most frequently implicated, generally with lardaceous disease of the vessels of the malpighian tufts or the straight vessels, or accompanied also by miliary growths, fibroid thickenings, or epithelium accumulation in the tubes; this renal complication is frequently the immediate cause of death.

Contrasted with the inflammatory varieties of phthisis, lesions of the intestinal canal are less common in the pure tubercular form, and when present, consist rather of lardaceous disease of the vessels and catarrhal congestion or inflammation of the mucous membrane with atrophy, than the serious ulcerative phases of the glandular structures; these ulcerative processes, as previously mentioned, appear dependent on the lung lesion and its advanced stages, and occur only after a lengthened interval and with textural disorganization, hence probably the relative paucity of them in this variety of phthisis, and the predominance of the prodromal mucous inflammation.

Emaciation of the frame is extreme in this variety, and partially accounted for by the long period of ill-health intervening between the local chronic disease and the advent of the lung lesion. The latter is rather one only of a series of implications of viscera dependent on a common cause, equally with the textural deteriorations, but having an origin in a dispersion of growths from a focus. It will be observed that I have brought forward no case of consumption in which the miliary growths were evolved in the lungs in obedience to a constitutional diathesis, and unconnected with prior local disease —the assumed typical form of phthisis. Great doubt has been cast by some observers upon the existence of such a form of disease, and I can find no clear authentic details of any case among "the varieties of consumption seen among soldiers" to allow of its inclusion in this essay; type forms of the strumous and tubercular diatheses, relatively unfrequent, are to be observed in the military segment of the community, yet, when followed by lung lesion, there is, in all the cases I have been able to collect, an intervening chronic suppurative local malady which justifies the regarding of such instances of consumption as secondary and incidental.

The supervention of tuberculosis on the products of local chronic inflammation has been attested by numerous observers, and needs no detail.

The sequence of events following the inoculation of animals is thus described by Dr. Sanderson. "Induration and suppuration of the sub-cutaneous "connective tissue at the point of insertion, and the formation of secondary "abscesses or indurated nodules in the neighbourhood, these often connected "with the primary one by cords of induration; enlargement, induration, and "caseous degeneration of the lymphatic glands following the seat of irritation; "secondary formation of nucleated adenoid tissue in the viscera. In the lungs "the tubercle is in the form of a kernel and cortex, the latter, lung tissue in "which new growth has taken place in the walls of the alveoli, while epithelial "cells have accumulated in the alveolar cavities; the kernel is a mass of "spherical nuclei, which occupy the loculi of a transparent non-fibrillated "stroma, *i.e.*, a solid transparent substance modelled into holes in which the "nuclei lie; these are identical in structure, no matter the organ in which "situated, and resemble the pulp of lymphatic glands."*

The marked agreement of the nodule described above with that found in the human subject in this variety is apparent; and, considering how closely the lung parenchyma in animals resembles that of man, that it is liable to show disorganizations not to be separated in any features from human phthisis, it is but in accordance with all analogy to infer a similar phase of evolution in both when miliary dispersion and pulmonary involvement is observed to be connected—in one with disintegrating purulent lesions artificially produced, in the other with the same diseased action pathologically developed.

As compared with the inflammatory group of consumption, this variety contrasts strongly in the numerical frequency of associated disease in the viscera, and the precursory constitutional deterioration and local lesion, suggesting great vulnerability of the frame, if not a diathesis. Although the type forms of these varieties are essentially and diametrically opposed, yet, looking to the lungs only, some of the examples of tubercular phthisis tend towards some of the tuberculo-pneumonic examples; the same diseased elements are present in both, but the anatomical arrangement of them in relation to each other is reversed, the which, with other associated details, indicate a divergence in origin and development of the pulmonary disease necessitating segregations.

We may sum up the main dominant features of this variety as—

(*a.*) A precursory chronic disintegrative disease in some portion of the body other than the lungs, and associated defective stamina of system.

(*b.*) Sequential nodular dispersion in which the lungs more especially participate.

(*c.*) The lung lesion bilateral, generally diffused over viscera, but generally more prominent in the apices; the onset accompanied by constitutional and functional pulmonary disturbance, not in unison with the ascertained accomplished disease of the lung as expressed by the stethoscope, the objective symptoms being those of broncheolar inflammation and lung engorgement passing rapidly into consolidation.

(*d.*) Rapidity of the course of the lung disease, and the frequency of associated changes elsewhere, especially in the renal organs, the combination leading to early and invariable dissolution.

(*e.*) Morbid anatomy: constant bilateral involvement, and general agreement between the viscera in extent and degree of disease present; no gradational regional separation, but a gradual merging of the least advanced into the greatest accomplished destruction; the constant presence of the miliary growth, its universal diffusion, its combination with the textural derangement in all its phases, indicating with its isolation in other portions of the viscus a priority of the pathological nodule in point of time and sequence of events; degree of lung disorganization never reaching the extent common to the chronic varieties, but early stages of inflammation and its products around the miliary tubercles, as a centre, predominating.

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* *Path. Soc. Trans.*, vol. xix., p. 456.

(*f*.) General prevalence of the miliary growths in other organs and tissues of the body also, and the frequently associated lardaceous disease of the solid viscera and intestinal canal, especially the kidneys.

Group III.

In numerical frequency this group is not potent among army consumption, being represented by a percentage of 5·14; this fact, together with an agreement in minor details with some of the varieties of the other groups, will allow of a comparative cursory description of the component varieties. The "local form of lung destruction" trends strongly towards the "first group" of phthisis.

Dysenteric Variety of Lung Destruction.

This variety has as a precurser the chronic intestinal lesion of the large gut, appearing only after a lengthened period of ulcerative changes, and either pursuing a combined course,* or, by the subsidence and healing of the original malady, assuming a major prominence in the ulterior results. There is no necessary involvement of the lungs even in the most prolonged dysentery, nor, as a rule, can we adduce any special feature which determines its onset in the individual examples.

In one instance, in the same viscus, there were present, hepatized portions sloughy; small cavities produced by the prior removal of the necrotic parts; parts comparatively firm with central caseous degeneration. When an opportunity occurs for observing the early stage of the process, we find that the acme of congestion is seated in isolated foci; the original inflammatory action is lobular, though, by subsequent coalescence, it may ultimately assume the character of lobar. The same feature is discernible in the grey hepatized tracts, the seat of rapid disintegration; here, not uncommonly, are interspersed portions approaching normal, or merely œdematous, indicating the centralization in disseminated points. At a more chronic stage we may observe the pulmonary tissue as though infiltrated with caseous material, merging around the circumference into a firm iron-grey hepatization, or the centre of the large tract the seat of breaking up and small cavities; while in the opposite lung may be seen isolated cheesy deposits not to be differentiated in anatomical details from those found in the sub-acute pneumonic variety: no miliary growths to be detected. On the other hand, we may note that the lung structure is universally disseminated with the adenoid tissue nodules and resembles in character the "tubercular variety," the miliary tubercles having preceded any ulterior changes and being present also in other viscera.

Hence we may observe that the lung-disorganization may be pneumonic or tubercular, in this respect agreeing with the experiments upon animals, which show that either one or the other form may ensue on the inoculation with caseous products, presupposing in this variety that the foci of infection are the pulpy and thickened pus secreting dysenteric ulcers. As regards the

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* This combined course, however, so far as the lung lesion is concerned, may be of a very insidious character, though not the less destructive on this account. For example:—A soldier lad, aged 20, died at the Royal Victoria Hospital, Netley, of chronic dysentery, after 476 days' illness, the later symptoms being intense vomiting and frequent stools inducing exhaustion and death, but no complaint of any thoracic symptoms had been made during any period of the illness. At the *post-mortem* examination the stomach was highly injected, and coated with thick mucus; the small intestines were studded with patches of intense catarrhal congestion, with great prominence of the solitary glands. Diphtheritic exudation was present in the caput cœcum, and the descending colon was studded with cicatrices and cicatrizing ulcers, with the surrounding mucous membrane flabby and swollen. The posterior half of the lower lobe of the right lung was hepatized. In the apex of the right lung was a cavity the size of a walnut, with ragged walls formed by dark-coloured, firm, surrounding hepatized tissue, which merged externally into comparatively healthy substance, the cavity giving the idea as though produced by the tearing away of the centre of the consolidated patch; the lower part of the upper lobe of the lung was in a state of recent hepatization, but clearly separated in age from that producing the cavern. No tubercle or caseous material was existent.

condition of the intestinal canal in the fatal cases, we may find it extremely varying, from the old open and spreading lesion to the cicatrizing sore, or completely healed leaving cicatrices, contractions, and atrophy; it is in such examples as the latter that the phthisis kills while the originating disease is cured.

Pyæmic and Embolic Varieties of Lung-destruction.

I link these varieties together on the presumption that the lung-disorganization in both is brought about through the same medium—the transference of emboli sms and local stasis. To the former is superadded blood-poisoning (septicæmia), and although septicæmia and multiple abscesses may be conjoined where no infarction as a precursor of the latter can be traced, yet in these lung-destructions it seems most probable that they are produced through the medium, not of the animal poison, but of the conveyance of the fibrous plug, its impaction and destruction of the shut off zone of tissue by direct gangrene or superinduced low inflammation. In pyæmia lung lesion is rarely if ever absent when other viscera are involved. In the various vascular lesions in which fibrous deposits are in existence the supervention of lung disorganization by embolic transference is occasionally observed; and in valve lesions with retarded circulation, thrombosis of the pulmonary vessels with local destructions of tissue are inconstant sequelæ.

As illustrating the mode in which these local disorganizations of the lungs are brought about, I append the following example of a pyæmia case with an early stage of pulmonary involvement:—

The pulmonary vessel from the right ventricle to the affected parts was filled with a decolorized coagulum. Traces of recent inflammatory action of the pleuræ were present. The lower lobes were mainly involved, and the seat of consolidated patches. On section these were of a dark maroon colour, interspersed with parts of a lighter hue. By pressure and washing some of the engorged intensity could be got rid of, when the lighter parts became more apparent by projection above the surrounding level. In the engorged portions, with a hand-lens, one could detect depressions (air-vesicles) separated by pale lines (swollen-out inter-alveolar tissue), and scattered over were spots and threads, bluish-black in colour (capillaries and small vessels with coagulated contents): this portion was below the normal consistence. The lighter parts were, as a rule, distinctly circumscribed, irregular in shape, four- or six-sided, reddish grey in colour, and mottled by bluish-black. The cut surfaces were comparatively smooth and consolidated, but depressions were observed here and there; the aspect was that of hepatized lobules with some of the air-vesicles free of contents. On examination by the microscope the capillaries were filled with blood-clots, the inter-alveolar textures occupied by medium-sized cells,* the alveolar cavities either free, or swollen out with cell growths, or occupied by blood-clot wholly or partially; the lung-texture broke up readily under the glass. The next stage was that these lobules became yet more clearly defined from the surrounding tissues; they softened and broke up, and appeared on section as a circumscribed diffluent material, a purulent collection, or a gangrenous patch. Thus far the process of destruction had passed through a prior phase of inflammatory action; but while these lobular pneumonias might be seen in one part, others equally defined could be observed elsewhere of a greenish-black colour and very fragile. With the microscope, there was neither intra- nor inter-vesicular products of disease, but the vessels were completely occluded; the tissue broke up with the slightest pressure, and it was clear that, as the result of curtailment of nutrition, the mass of embraced lung-substance had necrosed. On following up these vessels it was found that their contents alternated in colour, a dark red zone succeeded by one of paler aspect, the one amassed red corpuscles, the other mainly fibrine. In some portions of the lung extravasion of blood had occurred, breaking up the vesicles; in others the blood had become moulded to the interior of the air-cell, or, coagulating, had contracted, leaving a clear space between the clot and the vesicular wall; in other instances a small clot with a large mass of cell elements occupied the area. In the inflamed parts the vesicles were irregular in outline, with the area contracted, partly from the infarcted vessels and

* Plate 2, fig. 7.

partly from the cell elements present in the inter-vesicular tissues; also, while some of the vesicles were distinctly consolidated with cell elements, others were not so, or only partially: these features, with others, leading to the inference that the inflammatory action in this form of active lung-destruction is essentially seated in the stroma and vesicular only in places, and in sequence to infarction of the vessels.

With the thrombus ensuing on stasis from heart disease, the lung disorganization is more chronic and traceable through apoplectic extravasations or fibrinous depositions.

Diabetic Variety of Lung-destruction.

The variety of phthisis here to be detailed is rarely met with in the military segment of the community, the precursor disease receiving but few illustrations. The engrafting of lung-destruction on diabetes would appear to be all but invariable, and to assist in the death production; the onset of the local lesion making itself manifest during the later stage, and often with rather acute symptoms. The disorganization has all the features of pneumonic consolidation rapidly breaking up under the constitutional deterioration. Thus, in one instance, the pleura over the right apex was adherent by recent lymph, the bronchi loaded with mucus; the upper one-third of the right lung was in a state of grey hepatization and oozing much fluid on section; the whole of the remaining lung was vascular, œdematous and friable; the pulmonary symptoms had ensued five days before death. In another instance the right pleural surfaces were adherent, and bronchi laden with mucus; the upper half of the left lung was œdematous, congested, with a few scattered patches of caseous material. The entire right lung was disorganized, the upper and lower lobes excavated into one large cavity, the middle lobe into a number of small ones, the intervening hepatized tissue was the seat of a few small, crude, yellow masses.

An example of a lung in this diseased state is given in plate 7 of "Addison's Lectures on Pneumonia and Phthisis." The apices were most extensively excavated, succeeded towards the base by small cavities, grey and red hepatization from above downwards, but not a vestige of crude material or miliary tubercle; the remarks of the lecturer are,—"it was a case of purely pneumonic phthisis and highly interesting as occurring in connection with the cachectic state observed in advanced diabetes mellitus."

The two former cases suggest a like production of the lung destruction. It would appear that in this essentially constitutional malady with the vitality of the body generally severely undermined, pneumonia is apt to supervene with no tendency to resolution, and that the products of the inflammation together with the imprisoned textures break away and disintegrate before (as a rule) the process of caseation can ensue, and hence the comparative absence of crude yellow material.

On the subject of pneumonia in diabetes, Dr. W. Fox states,—"It may "either be the acute lobar form, or may occur in disseminated lobules tending "to undergo a necrobiotic or cheesy change, and which appear to be closely "allied to, if not identical with, the tubercular process."*

Local Variety of Lung Destruction.

In this variety I have collected a series of cases of local origin which are either preceded by an adjacent diseased process which induces inflammatory action in the contiguous pulmonary textures or by the presence of a foreign body. Two examples have occurred to me personally and two more I observe in the records at Netley in which the lung lesion ensued on long continued adjacent disease,—in three instances following extensive purulent formation in the thoracic parieties, and in one, caries of a dorsal vertebral body. In all cachexia was present and in two great deterioration from alcoholic inhibition. The purulent collections formed, one on the right and one on the left lateral region of thorax in the subcutaneous cellular tissue, in the third above the left breast and apparently beneath the great pectoral muscle. The abscesses on being opened assumed a chronic character and were followed at an interval varying from three weeks to eight months by distinct signs of consolidation of the subjacent lung texture and subsequent disintegration. In the instance of the upper part of the left lung becoming involved the symptoms of lung

* *Reynolds' System of Medicine*, vol. iii., p. 618.

implication were remarkably acute with sharp stabbing pains, intense dyspnœa, followed by an expectoration of pus to the extent of ʒ viij and clear stethoscopic evidence of a cavity; after a lengthened period this man recovered. The other cases were more gradual but not less clear in the lung disease and disorganization.

An excellent example of foreign body irritation on a large scale is seen in a preparation in the Netley Museum—the left lung occupied by a large hydatid cyst. The man was invalided from Gibraltar for phthisis, there being distinct stethoscopic and other signs of lung destruction; after remaining in the hospital for some time the right lung also became partially affected and the man died from hectic and exhaustion. After death, in the right viscus were crude deposits which merged into surrounding hepatization evidently inflammatory; the left is the seat in the anterior half of one large hydatid cyst which is enclosed by the pleura in front, thickened and tough. The cyst wall is separated from the parenchyma, which adjacent to the hydatid is smooth fibrous-looking and thrown into ridges by firm hands, resembling the interior of an old latent cavity; beyond this, caseous material is present merging externally into firm hepatized tissue. The caseous deposits, numerous also in the apex, have disintegrated in many places into small cavities. The aspect of the lung points to a long series of changes following the lodgment of the animal-irritation, inflammatory products subsequently degenerating, growth of the parasitic sac, atrophy of the surrounding diseased tissue consequent on pressure, the hypertrophied fibrous framework of the viscus only resisting and forming the ridges seen on removal of the sac; eccentric gradational involvement of the pulmonary parenchyma and caseous degeneration of the disease products corresponding to the growth of the animal.

Aneurisms pressing on the lung tissues not uncommonly unfold the same picture of degradation and the same may be stated of hepatic abscesses pointing through the lung.

Into the category of "local phthisis" would fall also those instances of lung disorganization supervening on the lodgment of foreign bodies in the air passages, a mode of termination of the case prevailing in by far the majority in which the inspired mass cannot be extracted (Erichsen). The reception of particles of iron, steel, stone, &c., into the bronchial ramifications and the nature of the disease thereby induced have been made the subject of inquiry by Dr. Greenhow and others, and detailed in the "Pathological Society's Transactions" from time to time,—in these examples the main stress is brought to bear upon the bronchi, the particles not apparently reaching the air vesicles, and it is through a process of bronchial irritation, fibroid thickening of the walls, production of fibroid nodules and involvement of disseminated patches of the lobules in a series of chronic inflammatory changes terminating in caseation that the lung disorganization is reached.

On two occasions I have had the opportunity of tracing out the sequence of events in the coal miner with the following results. Both occurred in soldiers who, prior to enlistment had followed the occupation accompanied by the inhalation of the fine particles. In the first, the death causation was independent of all lung disease, and the condition of the pulmonary tissues here noted shows the early stage prior to the development of actual disease. The man had died of syphilis, but the lungs, with the exception of lobular pneumonia apparently specific, were not diseased. Before section patches of dark pigment could be observed through the pleura indiscriminately scattered with intermediate normal colour, these patches were composed of granules aggregated in a stellate matter and averaged one-third of an inch in diameter. On section of the lung the carbonaceous particles were arranged as above mentioned, having the cut bronchus as the centre of the star, or, on the other hand, when the bronchus was cut lengthwise then the patches were elongated, but under either condition radiating from the tube and more concentrated in depth near it. On opening up the bronchus the particles were seated in the mucous and sub-mucous coat, and had penetrated beyond this to the depth of one to two lines into the surrounding pulmonary parenchyma. The air vesicles were free from them, the larger and medium-sized tubes also, the broncheoles and the encircling tissue had received them, and been penetrated by them, and this without the least trace of any inflammatory action remaining.

In the other example the man had not followed his avocation as a miner for

11 years, he had been in average good health until six months prior to death, symptoms of chest disease of an inflammatory nature had originated rapidly followed by disorganization and accompanied by black carbonaceous sputum in which the particles were easily detected. After death all diseased action was found limited to the lungs, the thoracic glands were enlarged and blackened, the one viscus was a counterpart of the other. On section the lung tissue was hepatized, firm and old except at the immediate base, of a coal black colour, which was in greatest intensity at the apex and diminished downwards. Cavities, crude material and pigment masses showed the successive stages. The apex was one large excavations succeeded by smaller ones with ragged interior and formed by mere ablation of deteriorated and necrotic pulmonary texture; below this, about the centre of the viscus, were nodules of yellow caseous material, mottled with black particles and contrasting strongly with the dark jet surrounding tissue; the base was crepitant and studded with small masses of carbon from a pin's head to a pea. Around the cavities in the right apex were a few sparsely scattered miliary growths and very limited in range. The lung substance was tough and the bronchial tubes showed evidence of long continued irritation and deep pigmentation. This pigmentation and masses were composed of minute particles of carbon from which no parts of the lung were free—air vesicles, bronchial tubes, stroma, pleura, glands. By reversing the extent of lesion present the process of involvement could be read, commencing with the base—carbonaceous accumulation, caseous material, disintegration and cavern production, miliary infection. The inspired particles had accumulated in the broncheoles and air vesicles, by irritation fibroid development had ensued around the tubes and cell growth in the vesicles, caseation of the products and the usual results. The disease had clearly had its starting point in the apex and involved the bulk of the viscus in a series of gradations from above downwards.

The dependence of such a lesion on pure external causation independently of any presupposed tendency from inherent diathesis or constitutional infirmity seems clear and incontrovertible, although to many minds the invocation of such an adjuvant to explain the sequence of events and to form the requisite factors of their theory is of paramount necessity; it is a *post hoc propter hoc* argument which unquestionably fails in many instances and is in complete discord with the previous history, clinical details, and pathology. It is in accordance with all analogy to suppose that where any inherent transmissible tendency to lung lesion of any nature exists then the inspiration of particles would be doubly injurious, yet it is no less in unison with facts that the most searching inquiry into the individual himself, his ancestors and family, his own offspring, often fails to supply this predisposition to disease: experience also has demonstrated that when the external causes are prevented, this internal urging of the vital functions towards pathological, not physological results may be completely ignored. A comparison of this "miner's lung," excluding the bronchial complication, with the details of the morbid anatomy of the "sub-acute pneumonic variety," will show that, in the method and process of involvement and the nature thereof, there is complete agreement; in the first instance the particles of causation are clearly traceable and ever palpable, in the second they are mainly animal and organic and fuse with the products to which they give origin, hence non-detectable; the inference is that in both the ultimate lesion is the same, the phases of production the same, the exciting causes similar in action though varying in nature. Hence it will be seen how closely this form of disease approximates to the "first group" in all essential particulars, and the propriety of linking it with the examples of transferred morbid action—the first forms of this "local variety—may be raised; the reasons for including such cases here are, that the existing cause is mechanical and palpable and not open to controversy as the first group, it is local in operation; the form constitutes a natural link with the internal irritation cases, while having much in common with the "first group":—it completes the circle of diseased action, the subject matter of this part of the essay.

Having described the main varieties of pulmonary consumption observed in the military segment of the community and detailed their nature, the scope of the first portion of the essay is embraced, and is concluded with a tabulation of the characteristic features of the forms of lung destruction for facile comparison of one with the other.

TABULATION of the Chief Characteristic Features of the forms of Military Consumption.

Group or Species.	Variety.	Prodromal and Clinical Details.	Pathological and Anatomical Details.
Inflammatory group of primary phthisis. Idiopathic.	Lobar pneumonic ..	Lobar pneumonia, generally acute, followed by stability of the disease products. Disintegration of lung tissue of the part previously the seat of the prodrome, generally the base, and very often limited to the one viscus. Death often resulting from profuse hæmorrhage from a cavity, otherwise far from generally fatal.	Lung destruction distinctly localized, often limited to one viscus and one lobe. Disease uniform, indicating one age throughout; consistence below normal. Evidence of original inflammatory action in the pleura overlying the diseased texture. Morbid elements—epithelial and spheroidal cells occupying the air vesicles. Caverns generally solitary, extremely large, crossed by trabeculæ containing blood-vessels, the whole of diseased products not uncommonly eliminated, and the excavation bounded by fibroid indurated tissue. May be complicated by miliary growths or secondary lesions elsewhere, but generally all disease limited to the pulmonary textures.
	Lobular pneumonic ..	Early stage, the prodrome, very insidious but when observed, presenting the clinical features of circumscribed sub-acute pneumonic inflammation, involving each viscus, though one often slightly in advance of the other, and commencing at the apex. History of case marked by successive attacks, which gradually implicate the entire organs. Destruction of tissue progressive from the apex downwards; disease chronic; may, when limited, be completely recovered from, but when fatal, generally terminating life by exhaustion and colliquative diarrhœa.	Each viscus illustrating gradations of disease from above downwards—chalky concretions, cicatrices or old cavities, softening caseous masses, crude firm masses, localized hepatization, each distinctly defined and representing individual attacks of diseased action. General lung texture softer than normal. Caseous mass limited to a varying number of contiguous lobules, forming tracts of disease rarely larger than a walnut. Morbid elements—epithelial and spheroidal cells occupying the air-vesicles, and at an early period can be turned out, leaving the vesicular framework intact. Disease not primarily involving the inter-vesicular textures or tubes, but these may be subsequently implicated, especially the former, and then leading to indurations around advanced disease and contraction, or even obliteration of cavities. May be complicated by miliary growths, which are observed radiating from a softened or softening patch, and from chronicity often accompanied by secondary lesions elsewhere of a varying nature. Limited disorganizations very far from uncommon in the lung apices of soldiers dying of other diseases and not recognized during life.
	Hæmorrhagic pneumonic.	Decided hæmoptysis the first symptom of pulmonary disease, occasionally traceable to severe exertion or chest constriction, but not uncommonly disconnected with appreciable cause, followed by inflammatory action in	Disease localized or diffused, texture softer than normal, involving one or both viscus. If localized, oft bilateral, presenting the anatomical details of the sub-acute variety and gradational, commencing at the apex, with possibly a blood-clot forming the nucleus of the caseous mass. If diffused, limited scattered lobular patches of inflammatory material, crude, caseous, or softening, all of one age, stud the parenchyma of a

TABULATION of the Chief Characteristic Features of the forms of Military Consumption—*continued.*

Group or Species.	Variety.	Prodromal and Clinical Details.	Pathological and Anatomical Details.
Inflammatory group, &c.—*continued.*	Hæmorrhagic pneumonic. (*cont.*)	proportion to the diffusion of blood in the air-passages and vesicles. If widely dispersed, presenting the features of acute phthisis, rapidly fatal. If limited, rarely in other site than the apex or apices, local disorganization may ensue to be recovered from, or followed by successive similar involvements of the organs, or from exposure to the agency of the lobular pneumonic form may exemplify in its subsequent phases the sub-acute pneumonic variety, the which, this localized hæmorrhagic form resembles in all respects except as regards the medium of blood irritation.	varying extent of one or both lungs, with surrounding engorged tissue and evidence of recent inflammatory action in the pleura and bronchi. Products of disease vesicular and cellular, commingled with blood-clot occasionally, and derivative pigment; muco-purulent contents in the tubes. Associated varicosity of capillaries occasionally observed, or distinct indications of ruptured vessel. The chronic localized form liable to the secondary complications of the other varieties, the acute generally exemplifying a limitation of disease to the pulmonary textures.
	Catarrhal or tubal, bronchitic.	Preceded by long-continued bronchial lesion of the smaller tubes, with viscid highly cellular sputa, bronchial symptoms gradually merging into those of consolidated lung, commencing at the apex of each viscus, and involving in successive attacks the entire organs. Disease chronic, producing death generally by exhaustion and intestinal complications, early stage may be recovered from, *i.e.*, when limited to the apices, but more fatal than the sub-acute pneumonic variety.	Extension of disease from the broncheole to the lobule, bronchi ulcerated, dilated or very vascular, especially those of minor calibre, and distended with purulent or muco-purulent contents, lungs firmer than normal—tough; disease bilateral and gradational from above downwards—cavities, crude masses from a lobulette to a strand of lobules, catarrhal infiltration lobular or diffused—aspect as of frog's-spawn; lungs permeated by fibrous bands uniformly distributed, the sequel of hyperplasia of the framework of viscus, surrounding and following the smaller bronchi, and diverging from the main bronchus at the root of viscus to meet strands passing in from the thickened pleural periphery; cavities small, formed from disintegrated lobules or dilated bronchi; disease involving the tubes, framework, and vesicles, contents of the latter large epithelial cells extending into the broncheole. More often complicated by the miliary growths than the congener inflammatory forms, the tubercles especially frequently grouped round a dilated pus containing bronchus, or arranged in the course of the smaller tubes, forming a linear series implicating a limited zone of the surrounding tissue.

TABULATION of the Chief Characteristic Features of the forms of Military Consumption—*continued.*

Group or Species.	Variety.	Prodromal and Clinical Details.	Pathological and Anatomical Details.
Intermediate sub-Group. Inflammatory phthisis secondary to a specific dyscrasy.	Syphilitic pneumonic.	Preceded by clear evidence of specific constitutional infection, the implication of the lung often accompanying the evolution of the early sequelæ—the skin and mucous lesions. Lung lesion originating in pneumonic symptoms and passing on to temporary stability of products, site of disease may be the apices, but often unilateral and irregular. Disintegration of pulmonary tissue accompanied by the specific lesions, and with them is not uncommonly rapidly fatal.	Site of diseased lung texture variable, in degree varying from firm pale hepatization to cavities, but generally of one age, and showing no gradations in the involvements; crude material limited to a number of aggregated lobules, arranged often in a serpiginous manner; texture before disintegration comparatively firm; products of disease intra-vesicular and cellular, but accompanied also with hypertrophy of the fibroid tissue elements. Associated with the lung disease are specific lesions, especially of the skin, mucous membranes, glands, and cranial bones, but rarely gummatous nodules in the viscera. Miliary growths and other secondary lesions may follow the disintegration of the caseous hepatizations, and then the syphilitic disease and the complications of the lung destruction are observed in the dead body, side by side.
	Syphilitic bronchitic.	Preceded by evidence of specific constitutional infection and bronchial involvement, co-temporary or alternating with cutaneous eruptions, or following extensive laryngeal or pharyngeal ulcerations. Bronchial lesion followed by lung consolidations (lobular), bilateral and apicial, or unilateral and irregular. Evidence of lung disorganization associated with the progress of the syphilitic lesions, and combined generally fatal.	Lung disease bilateral or localized. Generally the former if accompanying the early evolution of the virus, and then equally involving each viscus, and in site from the apex downwards; lesion lobular; lung tissue under disease firm and tough, evidence of long continued bronchial inflammation. Disease generally localized, if in sequence of, and associated with, laryngeal ulceration—later syphilitic evolution, and constant in the presence of ulceration or its remains in the bronchial tubes leading to the lung district disorganized. All disease generally indicating one age, the result of one attack. Syphilitic lesions are observed in the body, but generally without the presence of gummata in the viscera. The anatomical details of this variety have much in common with the simple catarrhal variety, equally as the pneumonic form, the product of the specific virus, has with the sub-acute pneumonic variety.
Nodular growths groups of phthisis. Secondary.	Syphilitic gummatous.	Preceded by a long train of syphilitic lesions and constitutional deterioration. Lung disease generally showing itself during the later stage of the virus-evolution and co-temporary with indications of mischief in other viscera also. Very variable in site and degree, often	Gummatous nodules of fibro-cellular elements precede and determine the lung disorganization, site more often near the periphery of viscus and the base, not necessarily bilateral and symmetrical. Products of induced inflammatory action amassed around the nodules, and disintegrating with them form excavations in the pulmonary tissues. Morbid elements, extra-vesicular—fibroid tumours and strands of fibroid tissue; intra-vesicular—epithelial and spheroidal cell-forms. May be followed,

TABULATION of the Chief Characteristic Features of the forms of Military Consumption—*continued.*

Group or Species.	Variety.	Prodromal and Clinical Details.	Pathological and Anatomical Details.
Nodular growths, &c. (*cont.*)	Syphilitic gummatous.	unilateral and towards the base, occasionally very limited in range. As compared with the inflammatory specific forms less fatal, but when so, progressing with the other lesions of the viscera, and terminating life by exhaustion. Occasionally distinct attacks of lung involvement.	while disintegrating, by miliary tubercle production and secondary lung lesions. Always accompanied by great specific textural deteriorations in the viscera, especially gummatous growths. The same elements of diseased action not uncommonly observed in the lungs of individuals classed in nomenclature under "syphilis," the pulmonary destruction in these cases playing but a minor part in the mortality causation.
	Tubercular ..	Preceded by chronic disintegrative disease in some texture of the body otherwise than the lungs, and undermining of constitution. Onset of lung lesion marked by severe constitutional disturbance, not in unison with the ascertainable degree of visceral implication, stethoscopic signs of small bronchial inflammation terminating in consolidation. Disease bilateral and diffused, running a rapid course and terminating life with involvement of other viscera, especially frequently the kidneys.	Bilateral involvement of organs, miliary growths universally diffused in the viscus tissues, and matted in all the disease present as originators of the inflammatory phases engrafted on them. All disease merging, no evidence of gradational involvement, but apices generally showing an advance over the rest. Amount of produced destruction in proportion to the extent of viscera involved far less than in the other forms of disease, the early stages of inflammation and its products predominating in the viscus, tubes, and serous coverings. Morbid products—extra-vesicular, adenoid growths,—intra-vesicular, epithelial and spheroidal cells, purulent or sero-purulent contents in the tubes. General prevalence of miliary growths in other organs and tissues. Wide-spread degenerative disease as an accompaniment, especially in the renal organs, and evidence of old-standing chronic precursory lesion. Anatomy demonstrating the lung disease to be but one of many involvements of the body textures from a common focus of structural growths development, and general deriorations.
Alien or engrafted group of phthisis. Secondary to dissimilar diseased states, but sequenstial.	Dysenteric ..	A long anterior stage of dysentery in its chronic form, lung disease originating with the features of the pure tubercular variety, or as a latent pneumonia of a larger or smaller tract of tissue. Lung disintegration, advancing with the intestinal lesion, and rapidly inducing death, or by the recession of the dysentery the phthisis assumes the whole potency in the ulterior results.	Pulmonary tissues exemplifying pure tubercular details with widely disseminated miliary growths, or limited destruction of more or less of the lung-substance, often localized and basal, with the surrounding features of hepatization and caseation of its products. Evidence of the merging of the pneumonia into disorganization not uncommon. Intestinal lesion may be in all stages, from cicatrices to sloughing ulceration, and the usual accompanying features of prolonged dysentery may be observed in the other organs.

TABULATION of the Chief Characteristic Features of the forms of Military Consumption—*continued.*

Group or Species.	Variety.	Prodromal and Clinical Details.	Pathological and Anatomical Details.
Alien or engrafted group, &c.—*continued.*	Pyæmic and Embolic.	Following a focus of pyæmic infection, or source of fibrinous deposition within the vascular walls. In the former aspect running a rapid course, with acute lung symptoms; in the latter, may be spread over a considerable period, with distinct recurrent attacks.	Lung destruction brought about by the transference of embolic clots and death of tissue, either direct by gangrene, or indirect through vesicular and interstitial inflammation. Pulmonary tissues presenting traces of recent action, with lobules (generally near the surface) fibrinous consolidated, purulent, or gangrenous; disease more severe towards the base, and accompanied by coagulation in the blood-vessels. Morbid products extra- and intra-vesicular, spheroidal cell forms approaching pus in character not uncommonly commingled with blood-clots, which are either within the air-vesicles, or forming an apoplectic mass in the broken-up substance of viscus. The foci of blood-poisoning, or fibrinous deposition, apparent in the body, with evidence of embolic implication of other viscera.
	Diabetic ..	Accompanying the later stages of diabetes, and assisting in the death-production. Lung disease, acute or latent in onset, irregular in site, the portion rapidly consolidating, and no less rapidly disintegrating.	Disease lobar, or involving entire viscus, and part also of other. Nature inflammatory and pneumonic, the destruction so rapidly following the consolidation as not to have passed through the process of caseation, hence large caverns, bounded by red or grey hepatized tissue, with possibly a nodule or two caseous and latent.
	Local.. ..	Lung disease following the presence of inflammatory action in the tissues in the vicinity of the pulmonary organs, or preceded by foreign bodies from without, and reaching the lungs either by the tubes through inspiration, or by the arteries, as in hydatid disease. The lung destruction, local or general, in accordance with the determining cause.	Presence of local irritating disease in the vicinity, or foreign bodies in the lung-tissues. Products inflammatory, vesicular, and broncheolar. If localized, the lung substance presents the features of destruction through caseation of inflammatory products; if general, the disease is bilateral, and not uncommonly gradational, the lungs presenting the features of the sub-acute pneumonic variety, with superadded possible broncheolar involvement and the presence of the foreign material among the diseased products. According to the nature of the irritant, the disease in the latter form may partake either of the bronchitic or pneumonic characters. May be succeeded by miliary development, but generally all diseased action is centred in the lungs.

PART II.

"The Hygienic Conditions under which they Occur."

This portion of the essay (using the term "hygiene" as "that branch of "medicine of which the object is the preservation of health") I understand to comprise all those conditions, no matter how induced, under which the soldier may be placed during his period of service, capable of producing, directly or otherwise, or assisting in the development of the varieties of pulmonary consumption detailed in the preceding part.

At the commencement of the essay, while explaining the course I had adopted, I alluded to the fact that, for the elucidation of the varieties of consumption current among the military segment of the people, I had collected cases occurring within a given period, 1860–71, so that in working out this second portion of the thesis I might be able to adduce the data scattered in the yearly Army Medical Blue Books, as the prevailing characteristic conditions under which the forms of disease described in the first part had originated; thus there is a mutual groundwork as a basis of each portion of the inquiry, and the deductions arrived at are more conclusive and reliable.

To facilitate the inquiry, the problem of etiology, we may arrange the several varieties of lung destruction previously detailed under three main headings of causation, each embracing the forms of disease in the corresponding pathological groups with these exceptions, viz., the including of the "inter-"mediate sub-group" under the second heading of causation, and the transfer of the "pure tubercular variety" to the third; adopting this slight change we obtain the following arrangement:—

Etiological Group 1.

Dependent on the exigencies of military service, corresponding to the forms of disease included in the pathological group 1, and represented in numerical frequency by a percentage of 73·81. This etiological group comprises the conditions pertaining to the life of the soldier as a special segment of the community, the compulsory circumstances under which the State places the enlisted individual from the time of his entry as a recruit to his death or discharge, and necessary involuntary in character, and to which is debited the mass of lung destruction generated in, and by, the service, the important inflammatory idiopathic forms of consumption.

Etiological Group 2.

The product of an enthetic virus—syphilis, embracing the pathological "intermediate group" and "syphilitic gummatous phthisis," and represented in numerical frequency by a percentage of 15·21.

Etiological Group 3.

Originating from prior textural derangements in some portion of the body other than the pulmonary organs, embracing the "pure tubercular phthisis "and pathological group 3," and represented in numerical frequency by a percentage of 10·77.

Groups 2 and 3 are sufficiently apparent and self-explanatory, but some elucidations of the conditions of the soldier's life comprised in the first group are necessary, and, although anticipating, may be here detailed, as they tend to render more apparent, and give an insight into, the subsequent observations substantiating and warranting these deductions.

Under the term "exigencies of military service," the following conditions connected with the prevalence of inflammatory lung destruction are comprised, with with the potency of each as a disease and death factor expressed as a percentage.

(*a.*) Vitiated barrack atmosphere, inducing "sub-acute pneumonic "consumption"—26·52 per cent.

(*b.*) Vitiated barrack atmosphere and chest constriction, inducing "hæmorrhagic consumption"—17·82 per cent.

(*c.*) Climatic variations mainly, inducing "acute pneumonic con-"sumption"—6 per cent.

(*d.*) Climatic variations, predisposed to in many instances by molecular deteriorations of the lung structures from the inspiration of impure air, inducing "catarrhal consumption"—23·47 per cent.

about a tourteenth part with respiratory impediment from tight clothing and accoutrement pressure—both preventable causes; one-fifth from climatic variations—not entirely to be guarded against; one-seventh germinating from a specific inoculated virus—capable of suppression; one-tenth bound up with other diseases and necessarily based on their prevalence or otherwise; in fact, seven-tenths of the mass of army lung destruction decidedly within the range of sanitary measures, and consequently capable of being eradicated.

In the first part of the essay I have endeavoured to show that the major portion of the army consumption is an essentially local lesion of the pulmonary viscera, inflammatory in nature; hence I propose before commencing the subject proper of the second part of the inquiry to supply other data than those furnished by morbid anatomy and pathology in support of this view; subsequently, to take the groups in order, and to concentrate the main attention upon the first—that most especially interesting in a military point of view, and falling most completely within the range of Army Medical Officers as a sanitary problem, the solving of which, with its enforced recognition by the State, cannot but be productive of immense saving both in men and money, and abstraction of a great cause of ill-health, pain, and misery from the community at large. To this end I have mainly followed a process of exclusion, by taking the feature and conditions common to the military class of the community, and eliminating *what are not*, I have, by gradually restricting the circle, endeavoured to render patent the causes *which are* in operation in the production of the inflammatory lung destruction—"the conditions under which it occurs"; subsequently, to strengthen the deductions arrived at, I have extracted from the independent and wide-spread observations of others, and adduced the evidence furnished by other armies and the navy, and the comparative pathology of the domesticated animals with the associated conditions of their lives.

Data corroborating the pathological deduction of the inflammatory nature of Primary Phthisis from the correlation of acute respiratory diseases and Consumption prevalence.

In the history of phthisis we may observe the following sequence:—A general concurrence of opinion among the older writers in respect to the connection between inflammatory lesions of the chest and the ulcerative changes comprised in the term phthisis, the merging of one into the other; their separation as pathological entities under the theory of Laennec; the revival of the old opinion under the teaching of Addison, Niemeyer, Williams, &c., and the differentiation of the disease into distinct forms from the experimental researches on the lower animals; and lastly, the re-asserted unity in nature of all consumptive lesions based on the morbid anatomy elements present.

In the old army returns phthisis, hæmoptysis, and chronic catarrh (pneumonia?) were combined under the one heading "diseases of the lung." These, as contrasting one period with another, showed from 1818–37, and from 1837–46, a slight decrease in mortality, and from 1860–69 an enormous subsidence, *e.g.* 7·98 per 1000 of strength, 7·38, and 3·11 respectively. This marked declension of the "lung destruction" during the latter period is in accord with the inflammatory lesion "pneumonia," as shown in the table.

PNEUMONIA.

	* Prior to 1836 per 1000 of strength.		1860–69 per 1000 of strength.			
	Admissions.	Deaths.	Admissions.	Deaths.	Invaliding.	Total loss.
Home—Dragoon Guards and Dragoons, 1836–7	14·92	·6	†5·1	·628	·106	·734
Mediterranean, 1818–36 ..	35·39	1·04	3·6	·303	·08	·383
North America..	37·77	1·39	12·4	·91	·14	1·05
Windward and Leeward Islands	22·4	1·29	1·8	·19	·12	·31
Jamaica..	13·53	·29				
Black troops (West Indies) ..	44·24	3·64	6·6	1·62	·15	1·77

* Davy, *Pathology of Army Diseases*, p. 291.
† All the home troops for this period.

"Prior to 1837 'lung diseases' were most fatal in the army among the "troops serving at home (especially the Foot Guards), in the West Indies, "Jamaica, Bermuda, Canada, and Nova Scotia";* and 1837–46 repeats the same features.

The statistics for the years 1859–69 inclusive show that the average annual admissions and loss from "lung diseases"† throughout the whole army were respectively 71·44 and 9·63 per 1000 of strength; the home segment contributing 85·20 admissions and 12·53 deaths and discharge against 57·68 and 6·74 of the foreign segment.

A breaking up of these figures of total lung disease into the components of consumption, and pneumonia and bronchitis combined, indicates thus:—

	Consumption.		Inflammatory chest lesions.	
	Admissions per 1000.	Loss.	Admissions per 1000.	Loss by Deaths and Discharges.
Home	11·36	9·23	73·85	3·30
Foreign	6·44	5·17	48·28	1·57
By subdivision of this period the same feature is apparent:—				
From 1860–64:—Home ..	11·45	10·04	77·42	3·66
Foreign ..	8·11	4·9	52·11‡	1·52
From 1865–69:—Home ..	11·29	8·4	70·23	2·95
Foreign ..	10·85	5·44	44·4	1·63

The combination of the whole army, giving for the two periods respectively, from 1860–64, 7·37 per 1000 consumption loss, with 2·58 per 1000 respiratory; from 1865–69, 6·92 per 1000 consumption loss, with 2·29 per 1000 respiratory; clearly indicating a distinct correlation between the loss from consumption in the home and foreign segments of the army respectively, and the severity of other pulmonary lesions exemplified by the loss from bronchitis and pneumonia§ combined; the same coincidence is apparent in the relative frequency of each (exemplified in the admissions), with the exception of the foreign force during 1860-64, as explained in the foot note.

Arranging the period 1859-69 into stations we observe as follows:—

	Consumption loss per 1000.	Respiratory Admissions.	Loss.
Home	9·24	73·83	3·30
Canada	5·05	70·1	2·20
Ceylon and India	5·34	56·67	1·77
Mediterranean	5·30	43·8	1·72
West Indies	5·04	40·5	1·62

Hence the only climatic variation which causes a deviation from the rule i that of Canada, and here the excess in the respiratory loss compared to the consumption ratio is due to acute croupous pneumonia, the form of inflammatory pulmonary lesion least frequently followed by caseation of diseased products and lung disorganization.

On this assumption it will be observed that in round numbers half the lung destruction in the army is connected with the vitiation of the air of respiration,

* *Army Medical Blue Book*, 1860, p. 138.

† Including phthisis, hæmoptysis, pneumonia, bronchitis.

‡ The excess of admissions during the early period, as compared with the later was owing to slight cases during the New Zealand wars and the Jamaica rebellion.

§ The pathological observations on the varieties of phthisis, and the frequency with which the minor degrees of pneumonia appear under "Bronchitis" in the returns explain the combination here under one heading.

Turning again to segments under the same climatic condition we shall find corroborative data. From 1860-69 the foot guards, while being at the head of the list of phthisis, are equally so in respiratory loss, giving an annual dimunition by bronchitis and pneumonia of 4·62 per 1000 of strength against 4·06, the average of the infantry quartered in the United Kingdom for the same period. A subdivision of the foot guards into two quinquennial portions gives the following facts:—

	Phthisis.		Bronchitis and Pneumonia.	
	Admissions per 1000.	Loss.	Admissions.	Loss.
1860–64.. ..	17·4	16·23	92·58	5·80
1865–69.. ..	12·76	11·65	58·88	3·44

The statistics of the Household Cavalry for the same periods are:—

1860–64.. ..	7·66	8·08	59·88	2·44
1865–69.. ..	13·64	14·18	74·1	1·31

Here during the latter period a diminution of actual loss from respiratory diseases in the cavalry is present with an increased ratio of phthisis, but on the other hand the increased prevalence of the former coincident with the latter is clear. An analysis of the respiratory admissions shows that the amount of pneumonia, during the years 1865-69, rose to 5·9 per cent. of the whole as compared with 2·4 per cent. of the five preceding years, a feature in accordance with the pathological deductions of the great mass of consumption in army life being pneumonic, and explaining the corresponding excess of phthisis in this segment during the period.

The foreign segments are as under, from 1859-69:—

	Phthisis.		Respiratory Diseases.		Proportion of Pneumonia to all Respiratory Diseases.
	Admissions.	Loss.	Admissions.	Loss.	
West Indies:—					
Whites ..	10·03	5·04	40·5	1·62	3·11 per cent.
Blacks ..	18·62	10·02	70·53	3·91	8·72 „

	Phthisis.		Respiratory Lesions.	
	Admissions	Loss.	Admissions	Loss.*
Ceylon:—				
White Troops	15·6	5·83	81·1	1·01
Black Troops	2·42	1·69	52·1	·96

Again comparing Nova Scotia, including New Brunswick, with Canada.

					Proportion of Pneumonia to Bronchitis.
Nova Scotia ..	8·6	1·54†	51·5	·98	16 per cent.
Canada	7·2	2·41	70·7	1·42	19 per cent.

* The discharge statistics for addition to deaths for total loss are not obtainable.

† The loss by discharge are not separated into the two districts in the returns, but amassed under the one name—North America.

The yearly Medical Blue Books also point out,—the lessened ratio of tubercular disease and lesions of the respiratory organs in the Malta Fencibles as compared with the English garrison; the decrease of respiratory disease with diminution of phthisis in Newfoundland; the coincidence of excess of bronchitis and pneumonia in the dockyard and arsenal stations at home with high ratio of phthisis—an all but annual remark from 1859–69, rarely excepted.

In spite of the general levelling tendency of frequent changes in the components of garrisons and stations, a scrutiny of these details will render it apparent, that when the statistics are spread over a sufficiently lengthened period for the exposition of mutual bearing between one disease and another, a marked correlation is observed between the loss from chronic lung disorganization and the amount of respiratory lesions, more especially the pneumonic. Such mutuality is certainly more than mere coincidence, it indicates the development of the inflammatory lesion under the same conditions which characterize the chronic ulcerative process, it supports their identity of nature, and corroborates the pathological deductions of the main forms of phthisis in the army being dependent on a prodromal inflammatory process.

Equally as phthisis and hæmoptysis constitute the main mass of "tubercular disease" in the army returns, so bronchitis and pneumonia predominate under the heading of "respiratory diseases"; these two latter forms of pulmonary lesions from 1859-69 making up an aggregate percentage of the whole respiratory lesions, at home 93 per cent. admissions, in the Mediterranean 89, in North America 91, with a proportionate loss of 8·5, 7·3, and 8·3 respectively. As regards their prevalence in the British Army we find them as follows, arranged in numerical frequency of station—United Kingdom, Black Troops in West Indies, Ceylon (white troops), Canada, India, Nova Scotia, Mediterranean, &c.

Of the two lesions the proportionate sickness caused by each under different temperatures is shown in the following:—

Variable climate (Home stations) bronchitis 74·99 admissions per 1,000 strength, pneumonia 5·1;

Sub-tropical climate (Mediterranean) bronchitis 37·17 admissions per 1,000 strength, pneumonia 3·6;

Sub-arctic climate (North America) bronchitis 46·84 admissions per 1,000 strength, pneumonia 10·3.

This refers to the actual sickness induced,—on the other hand the relative influence of each disease in its production is in the following proportion; pneumonia—Home 6 per cent., Mediterranean 8, America 17—the bronchitis being respectively 87, 81, 74.

Hence bronchitis is the respiratory lesion *par excellence* of climatic variability with atmospheric moisture, while pneumonia preponderates as we advance to the extremes of heat and cold*; admitting the premises of the prodromes, these details must greatly influence the amount and the variety of pulmonary consumption characterizing the zones of temperature.

A feature to be remarked in the military statistics is the comparative stability of the pneumonia in the individual stations year by year, any divergence in the prevalence of respiratory disease from the ordinary standard being referable to bronchitic fluctuations—the most cursory perusal of the observations in the yearly Blue Book will substantiate this.

To corroborate the deductions from the army statistics in the mutual association of the inflammatory diseases and consumption are the following: M. Jourdanet, in his work on Mexico, contrasts Yucatan and Tabasco, on the shores of the Gulf, the one decimated by phthisis which runs an acute course

* Hannover, in his inquiry into the "Diseases of Artizans," quoted in *Med. Chir. Review*, Oct. 1862, p. 427, observed that bronchitis was more frequent among those exposed to variations of temperature, such as bakers and smiths, while pneumonia seldom attacked them, in his opinion an indication that the causation of the two diseases was different in kind; pneumonia was especially prevalent among coopers, millers, saddlers, painters, and turners, who, on the other hand, were less liable to bronchitis.

in three or four months or "overwhelming the pulmonary vesicles by the "rapid development of tuberculizatiou it kills the patient at the outset "through the occurrence of softening," "it seizes both those who are "predisposed to it and those who might have been supposed to be "guaranteed against its attacks—pneumonia also is very prevalent with other "inflammatory affections"; on the other hand at Tabasco, phthisis and inflammatory lung affections are all but unknown. Hammond, in "Hygiene," remarks that during three years' service in New Mexico, in eight different stations ranging from the extreme north of the territory, he saw but three cases of phthisis; also that "inflammation of the lungs is very unfrequent as are likewise pleurisy and bronchitis." In the lung disease of the St. Jean d'Acre, bronchitis, pneumonia and consumption were co-existent under the same conditions of atmospheric vitiation, "and the pleuro-pneumonia had a phthisical complication" (Bryson). In the vital statistics of the United States* the association of a minimum of phthisis with that of pneumonia is shown, a dry cold climate being opposed to both, while both predominate in the South Atlantic region. Dr. C. A. Gordon† gives the succeeding statistics of the civil community which bear out the relation of the one to the other and both to surface area.

Square yards to each person.	Death rate per 100,000 living.	
	Consumption.	Other pulmonary diseases.
180	375	659
119	405	771
35	485	914

"On the increase of phthisis in Italy" it is remarked that "although the "deaths from pneumonia do not follow exactly in proportion yet pneumonia is "very common, and deaths 99 in proportion to 110 consumption."‡ S. Marques, on the Portuguese army, points out the comparative absence of pneumonia and phthisis in the country districts of Portugal, and their acme in towns, the main army diseases being "bronchitis, broncho-pneumonia, and phthisis. From 1861–7 Lisbon garrison gave 11 cases of consumption per 1,000 of strength, and Oporto 15·6, with 5·2 all other stations combined; the average of pneumonia was 11·8 admissions and 1·23 deaths in excess at Lisbon, less so at Oporto, while on the other hand Oporto predominated in bronchitis followed by Lisbon; in Maderia and the Azores "not one death from either of these diseases occurred in 6½ years."§ The great mortality agent among coal miners is phthisis, the forms of disease from which they suffer—"asthma, bronchitis, pneumonia"‖; and Lombard certifies that "while acute bronchitis is not a common malady yet a chronic capillary "bronchitis is almost a special disease among them."¶ Iceland is constantly quoted as one of the few segments of the earth in which "lung destruction is all but absent, here pneumonia also is said to be very rare."** Douglas, in 1819, in Canada, observed the connection between the prior lung inflammation and the subsequent disorganizations as phthisis, and with reference to the former he states that "the soldier either when engaged in the services of the field or in "the duty of a garrison was alike subject to an attack of pneumonia. It was "produced in some by exposure to cold on picquet; in others by acts of "intemperance and sleeping out of doors under night. It sometimes "happened that those individuals were seized by the disease who in order to "void their urine were accustomed to leave for a short period their

* *Med. Chir. Review*, 1858, April, p. 356.
† "Army in relation to Public Health." *Med. Chir. Review*, 1871, Jan., p. 154.
‡ *Med. Chir. Review*, 1870, Jan., p. 113.
§ Quoted from *Med. Chir. Review*, July, 1871.
‖ *Med. Chir. Review*, 1859, Jan., p. 10.
¶ *Annales d'Hygiene*, tom. xi., p. 45.
* W. Fox, *Reynold's Medicine*, vol. 3, p. 608.

"*crowded and overheated barrack rooms* by night."* He noted also the absence of consumption among the Indians who led a life of "war, hunting and fishing." As contrasted with this is their present state both in reference to the conditions of life and associated disease—the nomadic life is gone, they are aggregated in squalid mud or wooden huts, hot and fœtid, they are intemperate, they suffer from consumption and general chest lesions in a marked degree, the infantile mortality is great, and granular ophthalmia not uncommon among them. Williamson† constantly refers to the excessive prevalence of catarrhal and pneumonic lesions in the West Indies, with their mild climate, totally irrespective of season, generally prevalent, equally as the congener—phthisis; he connects the latter with "excessive drinking, sudden transitions from heated rooms to night air, libidinous pursuits"—the want of cleanliness and of all sanitation as an associate is very apparent.

It is unnecessary to pursue further a detailing of such extracts; they indicate a mutual relation between the one set of lesions and the other evinced in the pathology; the one varying *pari passu* with the other as exemplified in the army statistics; the conditions characterizing the development of phthisis being essentially those under which the inflammatory lesion originates. Considering the many forms of pulmonary disorganization and the variableness of the agencies in operation in its production, it is apparent that the statistics year by year, and segment by segment, of the army could not exemplify that correlation between the individual totals of *all* forms of phthisis and the associated actual amount of respiratory disease which is demonstrable by embracing large numbers, and a sufficient period to set aside minor disturbing limited agencies and to allow full scope for the major influences to assert their potency, and this the Blue Books amply testify. The forms of disease included under the headings of "respiratory diseases" are especially acute and chronic bronchitis, lobar pneumonia, the first probably embracing wholly catarrhal pneumonia; hence these may be regarded as giving a distinct impress of their prevalence and severity in the corresponding forms of pulmonary consumption—acute pneumonic and catarrhal phthisis; and as the prodromes are mainly dependant, as seen in the military segment, upon climatic agencies and variations so their sequelæ should preponderate in the mass of disease of the temperate zone statistics. But there is clear evidence of a form of pneumonia, sometimes acute and lobar, but far more often sub-acute and sub-lobar in extent of implication, often latent and often included under bronchitis, intimately bound up with town life, overcrowding, and vitiated air, and in degree of prevalence and importance far in advance of the climatic form; it is characterized by no special terrestrial locality or atmospheric variations, but seems to preponderate greatly in the warm regions of the earth, in the moist purlieus of over population and defective sanitation; it is the form of inflammation which originates the sub-acute pneumonic variety of phthisis, that so prevalent in the army, seen so frequently in conjunction with continued fevers and ophthalmia. The facility with which a pneumonia with absence of pain and expectoration may be confounded with continued fever has been adverted to by Addison and others‡; the frequency with which limited lung involvement is found associated with, or following the ardent continued fevers of the sub-tropical regions, such as the Mediterranean, I can personally vouch for, as well as the frequency with which consumption is found to date from such an attack; the conditions of one are the conditions of the others, and I cannot but consider that under the heading in nosology of "febris continua"§ this insidious lung inflammation, the first stage of the ultimate tissue destruction, is not unfrequently embraced.

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* *Topography of Upper Canada*, by Assist.-Surg. Douglas, 8th Regt., p. 44.

† *Observations on the West Indies*, 1798.

‡ *See* also remarks by Dr. Peacock, *St. Thomas' Hospital Reports*, vol. 1, p. 36.

§ I do not refer here to typhus or typhoid, but that form of general febrile disturbance so common in hot climates, with no pointed local implication for differentiation; the form so common in the Mediterranean, affecting especially new-comers, and so intimately bound up with defects in barrack construction and atmospheric stagnation.

Pneumonia is absent from no army statistics, whatever the climate, and more particularly fatal among the Black Troops of the West Indies. Davy refers to the irregularities of the disease in ratio to climatic variations and lowness of temperature, and "its dependence on other ill-defined agencies productive of it in an epidemic or endemic form."* 'S. Marques,† upon foul air in barracks, observes that it was this identical defect which produced an outbreak of pneumonia in Guarda in 1853, the much more considerable epidemic in 1859 and 1860 in the depôt of recruits at Mafra which equalled the devastation of the yellow fever; also in 1860 and 1861, in the 7th Cavalry Regiment at Bragança, in the 14th Infantry at Vizen, and in the 4th Cavalry at Santarem. This connection in causation is no less apparent in the outbreak in the St. Jean d'Acre, and statistics prove that in England pneumonia and bronchitis are more prevalent and fatal in the towns than in country districts, and "less frequent in the keen air of Northumberland and Durham than in the more relaxing atmosphere of Devon or Hampshire." The frequency with which pneumonia is associated with general disease suggestive of blood poisoning and impurities cannot be overlooked. It thus appears to acknowledge an internal agency or an external cause, and to be linked in etiology with:—(*a*) atmospheric variations and lowness of climate temperature; (*b*) overcrowding and impurities of respiratory air; (*c*) mechanical agencies—external violence or the inhalation of foreign particles organic or mineral; (*d*) blood poisonings and accumulation of effete products in system from defective elimination; and in its results to embrace lung disorganization under one or other form of pneumonic phthisis, less frequently when seen as an acute lesion, and markedly when connected with respiratory vitiations.

On the other hand, bronchitis is *par excellence*, the lesion of temperature variations and relative excess of humidity, and acknowledges a relation to climate in a much greater ratio that its congener—the vesicular disease; yet not entirely so, for it is clear that the inspiring of irritating particles, especially metallic and heavy, act rather on the air tubes in their continuity than in their ultimate expansions in the cœcal extremities in the lobules; the association of this disease also with blood dyscrasias is to be observed, and its connection with the evolution of the cutaneous eruption of syphilis has been already noted.

We cannot disconnect these inflammatory lesions, tubal and vesicular, from the ulcerative process known as phthisis, nor can we range them in the army as secondary and engrafted on a tubercularly disposed lung, the balance of evidence on the contrary favours a transposition of the former to the position of a prodrome, and the latter to that of a sequel.

In what ratio these two forms of thoracic disease, as a counterpart of the phthisis predominance, prevail in the army, as compared with the civil segment of the community, is a difficult problem to solve, so few data being forthcoming as an accurate basis for inquiry. Professor Parkes remarks that "the opinion "that the military suffer more than the civil population from pneumonia is an "old one, and that they suffer less in the field than the garrison."§ He gives the average death-rate from this disease among the inhabitants of London, at the soldiers' ages, as 1 per 1,000.‖ From 1859–69 the home segment of the troops had an average death-rate from pneumonia of ·628 per 1,000 of strength, augmented to ·734 by combination with the loss by discharge; hence there is an apparent advantage to the soldier. The average civil mortality from bron-

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* *Pathology of Army Diseases*, p. 293.

† Quoted from *Med. Chir. Review*, April, 1863, p. 394.

‡ *Med. Chir. Review*, 1859, Jan., p. 11.

§ *Practical Hygiene*, p. 577. Also the statistics produced before the Sanitary Commission for 1859 corroborates this. At p. 511 an excess of deaths from diseases of the respiratory organs generally (including phthisis) is shown in the army, as compared with the civil population, and at p. 512, the Commissioners sum up—"It "is evident that phthisis follows the same law in respect to the whole group of dis- "eases of the respiratory organs," from which we may infer that the prevalence and degree of the one were co-equal to that of the other, and both in the ascendancy among the military as compared with the civil class of the same age.

‖ *Practical Hygiene*, p. 578.

chitis for 15 years equalled 1·34 per 1,000, and amounted in London to 2·2 per 1,000 of inhabitants, being in excess at the extremes of life.* Taking the maximum of the latter and combining it with the 1 per 1,000 of pneumonia, we get an average loss in the civil community from the two respiratory lesions of 3·2 per 1,000. From 1859–69 the ratio of loss from these diseases at home in the service was 3·3 per 1,000, and in the foot guards 4·52; here indicating a disadvantage to the soldier, and more especially as, in reference to bronchitis, the ages at which he serves are the least fatal in the civil community. Remembering the physique of the guards and the care taken of them in hospital towards recovery from these diseases, it is difficult to resist the conviction that an annual loss of 4·52 per 1,000 during 11 consecutive years represents a frequency and degree of severity of pneumonia and bronchitis far in excess of the civil population of the same age; and the same holds good of the 3·3 per 1,000 loss throughout the home segment generally. It may be fairly assumed, as a postulate, that equally as the service generates consumption, so does it furnish in excess the causes of the acute respiratory disorders.

Etiological Group I.

A reference to the disabling causes of the masses sent home from foreign stations for change of climate or discharge from the service, as set forth in the Annual Army Statistics, will show a marked predominance of pulmonary consumption, and a perusal of the Mortality List at Netley indicates the same feature, substantiating that lung disorganization is the main lesion of a chronic nature in the foreign segment of the army, equally as it is the most important item in the death and discharge causes at home, and demonstrating (similar to heart and vascular disease, which rank next to it in chronic deaths abroad and at home) agencies in operation intimately connected with the soldier and his calling, surrounding him in his native clime or in whatever portion of the globe he may be called upon to serve, and in the United Kingdom weighing more heavily on him, a chosen individual, than on the class, age for age, from which which he was drawn. Under the old system of classification, phthisis and hæmoptysis appeared under the head of "Diseases of the Lung." What other (if any) lesions were included beyond chronic catarrh does not appear certain. In the subjoined Table I have embraced under the first two periods "diseases of the lungs"; in the third, phthisis, hæmoptysis, bronchitis, and pneumonia. It will indicate the extraordinary range of the latter years as compared with the earlier, and how little climatic causes were in operation in their production, a constant excess in the home segment, and the prominent position of the Foot Guards, throughout the entire period.

Per 1,000 of strength.

	Before 1837.		1837–46.		1860–69.	
	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.
Home:—						
Household Cavalry	..	8·1	..	6·55	76·	4·21
Cavalry of the Line	148·	7·7	152·	7·3	69·3	2·79
Foot Guards	..	14·1	161·	13·8	90·9	4·07†
Infantry of the Line	..	..	171·	10·3	88·2	3·46
Foreign:—						
Mediterranean, Ceylon, and India ..	93·8	4·68	106·2	4·31	57·65	2·98
North America	136·5	6·9	154·5	6·6	71·5	2·66
West Indies (whites)	108·6	8·8	114·	8·5	47·4	2·12
Cape	98·	3·9	103·	3·2	51·	2·47
Australasia	..	..	102·5	4·25	62·1	3·74

* Roberts on Bronchitis, *Reynold's Medicine*, vol. 3, p. 885.

† The diminution in the Foot Guards, as compared with the Household Cavalry in deaths is owing to the excess of invaliding in the former, the addition of which would show the same predominance of the Foot Guards throughout.

The yearly proportion per 1,000 of strength of admissions and combined loss,* by deaths and discharges, from phthisis and hæmoptysis from 1861-69, inclusive, is shown in the following Table :—

HOME Segment—Foreign Segment—Whole Army—Admissions and Loss per 1,000.

Year.	Home.		Foreign.		Whole Army.	
	Admissions	Loss.	Admissions	Loss.	Admissions	Loss.
1861	12·14	12·	8·01	4·64	10·12	8·32
1862	11·18	10·96	8·1	5·72	9·64	8·34
1863	11·24	9·69	8·96	4·58	10·1	7·13
1864	12·	9·52	7·8	5·85	9·9	7·18
1865	14·72	9·05	9·68	5·9	12·2	7·47
1866	10·9	8·9	10·88	5·15	10·89	7·02
1867	10·24	7·38	11·16	6·84	10·7	7·06
1868	10·01	7·37	10·87	5·43	10·44	6·4
1869	10·6	9·5	11·7	3·9	11·15	6·7

A perusal of the table indicates a decided tendency to decline of the disease in the army at large, comparing the later years with the earlier; more marked in the home than in the foreign segment, and suggesting a gradual decrease of the conditions upon which the lung disorganization depends; it also points out the predominance of the conditions originating the sum total of phthisis at home as compared with the foreign stations, and their universality during the whole period, no marked variations characterizing the preceding or succeeding of any one year in either segment.

The subjoined Table demonstrates that the decline marking the home segment was limited to no special branch, but was comparatively general in its operation, with the exception of the Household Cavalry; the excess of consumption among the latter during the later portion of the period was, as before shown (p. 360), cotemporary with a marked advance of severe inflammatory lesions of the chest, as exemplified by double pneumonic admissions, the cause of which is not apparent. The figures also point out the constant high ratio among the Guards, whether horse or foot, compared with their equivalents of of the Line.

YEARLY Admissions and Loss by Phthisis in the Troops quartered in the United Kingdom from 1861 to 1869, calculated per 1,000 of strength.

Years.	Light Cavalry.		Cavalry of Line.		Royal Artillery.		Military Train.		Foot Guards.		Infantry Regiments.		Infantry Depôts.	
	Admissions.	Loss.	Admissions.	Loss.	Admissions.	Loss.	Admissions.	Loss.	Admissions.	Loss.	Admissions.	Loss.	Admissions.	Loss.
1861	7·3	6·56	8·5	12·1	10·	8·22	14·3	12·6	19·7	18·07	9·7	8·68	15·5	17·92
1862	10·6	11·14	6·5	5·47	9·5	10·56	4·8	4·84	19·3	20·62	12·1	8·09	15·5	15·16
1863	8·2	14·8	9·3	6·17	9·6	5·97	11·1	6·85	16·5	12·38	12·3	9·25	11·7	8·37
1864	8·2	10·69	8·8	7·37	13·9	8·38	7·7	5·14	17·4	14·32	13·9	9·42	14·1	11·16
1865	22·2	10·72	8·	4·98	13·8	7·5	12·5	7·8	18·2	14·55	13·4	8·43	15·	9·49
1866	9·9	13·23	8·5	5·85	12·8	9·61	6·8	4·2	13·3	12·4	11 6	7·44	13·4	9·63
1867	13·9	7·35	5·9	5·8	14·	7·39	5·3	3·03	12·4	11·	9·	6 51	11·2	11·64
1868	9·1	13·21	7·4	4·57	9·5	6·96	8·5	3·31	9·3	8·23	11·2	6·56	17·1	9·16
1869	13·1	16·4	6·9	5·2	9·4	8·	7·3	4·8	10·6	12·1	20·2	7·	18·7	13·

* The necessity for such combination, in order to get an accurate idea of the prevalence and severity of the disease, is observed by Dr. J. G. Balfour, F.R.S., at p. 22, Blue Book for 1860, and also by the Sanitary Commission of 1859. As a contrast of the results of taking as a basis the deaths only, omitting the discharges, I append the following, and for this reason, that deductions from the former only in reference

The quotum furnished by each station or district of the foreign contingent is as follows :—

	Loss per 1,000 of strength.
North America	4·15
Malta	4·9
Gibraltar	5·7
Bengal	4·73
Madras	3·54
Bombay	6·27
Cape	5·21
West Indies (white)	5·04
Ceylon (white)	5·83
Australasia	6·36
Black Troops :—	
West Indies	10·02
Ceylon	1·69

These figures point out a marked uniformity of the disease as a cause of service-loss throughout the whole of the foreign stations of the army, the highest ratio being from the Australian colonies, the nearest approach in climate to England. The extraordinary deviations of the black troops in the West Indies and Ceylon from the white ratio—in the one in excess, in the other in the minority—are highly suggestive on the point of etiology.

If we break up the stations into zones of temperature, for the same period (1861–69) we obtain the details set forth in the following Table, to which I have prefixed the admissions and deaths from tubercular diseases from 1837 to 1846 as a contrast; the tubercular list comprising no other disease than phthisis and hæmoptysis in a ratio capable of modifying the deductions drawn from it pertaining to the lung disorganization.

Per 1,000 of Strength.

	Tubercular Diseases, 1837–46.		Phthisis, From 1861 to 1869.		
	Admissions.	Deaths.	Admissions.	Deaths.	Total Loss.
Canada, Nova Scotia, and New Brunswick (sub-arctic)	10·65	4·87	7·75	1·48	4·15
Home Stations (temperate)	25·17	7·94	11·25	2·70	9·24
Mediterranean (sub-torrid)	11·73	5·24	8·30	1·37	5·30
India and Ceylon (torrid)	16·6	4·28	11·53	2·27	5·34

Showing a marked decrease in all the zones of the later as compared with the earlier period; and, as regards 1861–69, an accordance between the extremes of temperature, a marked excess in the variable climate of the temperate zone, shown also in a minor degree in that of the southern hemisphere—Australasia.

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to this disease, contrasted with the civil population, have been made, but are strongly at variance with the combined results.

The average male mortality in civil life from 20–45 (soldiers' ages) is, per 1,000 of living, 10·29 all diseases, 3·86 phthisis. The average army mortality of the home troops is 7·91 per 1,000 all diseases, 3·63 phthisis; hence the advantage is to the soldier; but by including the discharges, we get—total loss from all diseases 37·53, from phthisis 9·23; showing a marked excess in the army not only from consumption but from disease generally. It is true that *all* the discharged do not die, yet a great percentage do; sufficient to raise the death average above that of the civil population.

Turning to the component branches of the service we observe the following,—a constant feature both at home and abroad, and no less perceptible in the Guards.

	Admissions per 1,000 of strength.	Loss.
Regiments of Cavalry and Depôts	7·88	6·44
Batteries of Artillery and Depôts	11·8	7·94
Regiments of Infantry and Depôts.. ..	·33	9·14

From these foregoing statistics we may deduce, that the conditions associated with the pulmonary consumption exist throughout the stations of the whole army, though in higher ratio at home, that they are constant in operation not fluctuating greatly from year to year, that they cannot acknowledge climate as a sole or major cause, that they weigh more heavily on certain corps and branches of the service, that they were inordinately more prevalent from 1818-46 than 1860-69, and that during the latter period they show a tendency to decline most perceptible in the home stations of the army.*

If now from the consideration of the army as of stations, segments, and corps, we direct our attention to the individual components, we find that by far the major portion of those exemplifying the disease embraced in group 1, range between 3 and 8 years of service and 21 and 26 years in age. This, however, *per se*, is of little value, it states the fact but allows of no inference unless supplemented by other data; these are furnished by a comparison of the numerical frequency of deaths from consumption at different periods of service and age with the numbers actually serving at the corresponding conditions in the army at large. The results are given in the appended tables, in which it is apparent that the morbific influences at work impress themselves on individuals in a ratio with the length of time of exposure, augmenting with the years of service; and as regards age, that they are less potent at the mid-period (that of comparative stability of the textures) and increasing towards the extremes, from 19 to 30 years (that of body development) being the medium, from 35 to 50 (that of tissue retrogression) the maximum.

Table showing the relation between age and service, and the mortality from inflammatory idiopathic phthisis expressed as a proportion.†

Under 19 years of age ..	5·	Of 1 year's service	·089
From 19 to 20	4·8	„ 2 „ „	·35
„ 20 „ 25	3·3	„ 3 „ „	·75
„ 25 „ 30	2·8	„ 4 „ „	·78
„ 30 „ 35	3·	From 5 to 10 year's service	1·6
„ 35 „ 40	6·	„ 10 „ 15 „ „	4·
„ 40 „ 50	8·5	„ 15 „ 20 „ „	8·7

Hence we may deduce not only that the conditions of group 1 are generally diffused throughout the service and constant, but that they are general in their

* The preceding statistics, from which these deductions are made, embrace groups 3 and 2 of phthisis equally as group 1; no means of separation exist, but the proportionate of the two former combined groups to the large group 1 is so small as not to invalidate the applicability of the deductions to the agencies of the main mass of consumption, the subject of inquiry in the present section.

† In this table only group 1 of consumption is included, the numbers of the age and service in the army corresponding to the mortality details are taken from the yearly Blue Books and the averages of a regiment at different periods scattered over ten years.

operation on the components of corps, weighing upon them as a body and common to the whole, not connected with personal peculiarities or details, but making an impress upon the sentient individual items of the mass in proportion to the duration of exposure to their noxious agency, and in proportion to the textural status of the individual body.

There is a decided and great excess of consumption in the army, as compared with the corresponding ages of the civil community; hence, whatever may be the nature of the lesions of the lung tissue to which the soldier is liable equally with the body politic by nationality, descent, and class, no sooner does he embrace a military life than symptoms of decadence become apparent; in the words of Professor Parkes, "a large amount of consumption is generated."

Thus to the immediate surroundings must we look for the elucidation of the problem;—the conditions present with the soldier under every clime and in every branch of the service, though fluctuating in degree.

What then are the conditions, permanent in agency, general in distribution, and independent of climate, characterizing this class of the community? They fall under the headings of:—

(*a.*) Special occupation with the attendant circumstances of life and duties.

(*b.*) Dress and accoutrements.

(*c.*) Ration, with which we can include the effects of alcohol and tobacco.

(*d.*) Barrack habitation.

Let us examine them in detail to elucidate their influence on the disease in question.

(*a.*) *Occupation.*—It certainly does not seem possible to connect any marked deterioration with the peace occupation, *per se*, of a soldier; on the contrary, it may be stated that its tendency is to maintain a high bodily vigour and development—a modified course of training. Discipline is irksome and a repetition of the same exercises, duties, and drills, is apt to engender monotony; and the great amount of spare time induces *ennui*, and that vacant weariness from want of occupation cannot be healthy; but, while depressing, these can hardly be considered to exert any ascertainable and consequential influence on the subject in hand. Celibacy does not tend to longevity, yet the rationale of its operation is not clear; there are no adduced grounds upon which to base the prevalence of self-abuse in the army consequent upon it: it may tend to dissipation and sensuality, but its influence would probably be mainly felt in the syphilitic list, and it was the opinion of an old writer* that "married men "suffered more from consumption than the unmarried, being under more dis- "advantageous circumstances to vigorous health as regards quarters and "diet." On the subject of actual work done by the soldier engaged in his ordinary duties, Professor Parkes remarks, "it certainly is not excessive, in "some days is even slight; a march of 10 miles with a weight of 60 lbs. "(which is nearly the weight a soldier carries when in marching order, but "without blankets and rations) is a moderate day's work"†; this latter is decidedly exceptional, occurring only at stated intervals; hence it may be fairly deduced, that the wear and tear of the body is certainly not above, but on the contrary, rather below that of a labourer. It is true that the advantage is on the side of the latter so far as freedom in the accomplishment of his work is concerned, yet the actual amount of time occupied in the rigid attitude of drill, &c., forms but a very modicum of the daily occupation of the soldier. An average of 5 years' mortality among the city police gave an excess of 4·0 per 1,000 of strength in those on night duty as compared with the day‡ hence we may conclude that a certain deleterious result is traceable to night employment, *per se*; § and when the conditions under which it is carried out in the army are considered—a hot guard-room, sleeping on a bench in a great

* Davy, *Pathology of Army Diseases*, p. 205.

† *Practical Hygiene*, p. 389.

‡ *Med. Chir. Review*, 1855, April, p. 428.

§ The Commissioners for 1859 placed but little stress upon this as a cause of disease, operating (if at all) less in the Cavalry and Artillery and most in the Line.

coat and tunic, and roused from probable perspiration to perform a monotonous too and fro "sentry go" in all weathers—it can hardly fail to conduce to surface chilling and pectoral disorders, especially if any predisposition be present.

Thus then, so far as this heading is concerned, during peace time, there are the enforced conditions of celibacy and night duty to mark their impress upon the army consumption list,—the former mainly, as it tends to the infection from syphilis and the production of the special phthisis,—the latter, through the inflammatory diseases of bronchitis and pneumonia; yet both combined can tend but little towards the excess in the military segment as compared with the civil of equal class and age.

(*b.*) *Dress and Accoutrements.*—Regarding the clothing of the soldier and the material composing it in the light of a weather protection it must be confessed that on this point he is far in advance of the class from which he is taken; under-flannel or flannel shirts form now part of the kit,* and any deleterious influences must be sought for in the make and fit of the tunic, the impossibility of throwing it aside while undergoing exertion, and the inapplicability of it to all the seasons and climates under which he serves; though, as regards the latter, special suits (as a rule) are in force to meet the requirement; of the former, generally there is no deviation between winter and summer. The soldier is proverbially careless,† and now as formerly, "after a "field day, or even ordinary drills, heated by exertion with buttoned up tunic, "he throws off all but his trousers and shirt in quest of refreshing coolness, "regardless of perspiration suddenly checked."‡

When to the tight tunic and constricting collar we add other chest pressure and respiratory impediments in the shape of accoutrement straps and knapsack we cannot but see that here are influences hurtful to the thoracic viscera, and more especially during marching and rapid movements. Professor Aitken on this point remarks, "that next to the inspiration of bad air, the imperfect or "continuously obstructed expansion of the chest tends more than any other "cause we know of to bring about diseases of the lungs and heart."§ During exercise, the functions most prominently brought into play is that of respiration, "the pulmonary circulation is greatly hurried, the quantity of air "inspired and carbonic acid expired is marvellously increased."‖ Under conditions favourable to exercise and respiration the excess of tissue destruction and excretions is partly got rid of by the increased pulmonary functions during the exertion, and partly is carried off during the subsequent period of rest; but if the lung circulation and the elimination of carbonic acid and water are impeded, accumulation must ensue, lung congestion be present, with a marked tendency to capillary rupture and extravasation of blood. The enormous quantity of excreta thrown off by the lungs during respiration and exercise is seen by the great vitiation of air resulting, and the necessity of ample cubic space in gymnasia.¶ Apply these facts to the soldier in "heavy marching order" on a field day and two features stand out prominently,—(*a.*) a general impairment of the body from excreta accumulation; (*b.*) an impediment to the pulmonary circulation entailing congestion and great tension of capillaries, opposed physiological action of the organs, deficient expansion of the air vesicles tending to accumulation in them and the smaller bronchi of the effete dead particles of organic matter of a surface varying from 10 to 20 square feet in extent; in fact producing, by external means, that deficient function of lungs associated with sedentary occupations, and which is so constantly adduced

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* By W. O. Circular for 1864.

† Professor Longmore, then Principal Medical Officer at Colchester, remarks (Blue Book for 1860, p. 206):—"A class most particularly heedless in exposing "themselves to atmospheric vicissitudes and influences with their shell-jackets or "tunics thrown open and their chests more or less bared; a custom greatly preva-"lent among soldiers generally when idling about barracks, and one almost beyond "the power of prohibition."

‡ Davy, *Pathology of Army Diseases*, p. 295.

§ *Growth of the Recruit and Young Soldiers*, p. 41.

‖ *Practical Hygiene*, p. 379.

¶ *Ib.*, p. 381.

as a cause of those molecular changes in the vesicles ultimately terminating in phthisis.

It is certain, then, that this feature of knapsack pertaining to the infantry soldier, this chest constriction, cannot but be productive of deleterious results to the lung textures, especially also when it be remembered that from the active exertions on parade he too frequently passes into a barrack room far from being in a state of atmospheric purity conducive to the elimination of the effete products unduly accumulated during exercise, and the re-establishment of the pulmonary equilibrium. Hence there is a general and local deteriorating influence set in operation, and considering the textural impairment of the delicate air cells and the capillary walls as a sequence of vitiated air inspiration, is it to be wondered at that, under the augmented arterial tension from chest constriction applied externally and an increased forcing action of the heart from the stimulus of exertion, extravasations occur, and that hæmoptysis as a cause of lung disorganization reaches such an high proportion in the military statistics?

It is thus seen that the accoutrements and fit of the tunic go hand-in-hand with barrack-room impurities in originating some forms of phthisis, and predisposing the lung parenchyma to minor degrees of ordinary irritation or external agencies, *e.g.*, night air. In these respects the soldier is decidedly at a discount as compared with his class of the civil population. Fortunately these baneful influences are well understood and are being guarded against, though tardily.

(*c.*) *Food.*—Professor Parkes on the subject of food and the comparison of the ration by its elementary constituents with a standard diet for an adult man, sums up :—"the quantity of nitrogen is considerably below that of the "standard diet, while the amount of carbon is nearly correct, only this is given "chiefly in the form of carbo-hydrates and not as fat. The diet would be "improved by the addition of more meat or of cheese, and by the addition of "butter or of oil."* The opinion that the meat is different in quality is general throughout the medical branch of the service; it was held by Sir J. Gibson, and is the subject of comment, year by year, in the Blue Book of the department. Granting, however, that the ration falls short in certain constituents, with an absence of variation in the amounts in proportion to the size of the individual and the mass of textures to be nourished, can it be considered as in any way instrumental in the production of the pulmonary consumption? Niemeyer, while noting the prevalence of the disease in asylums and prisons, remarks :—"the objection that the frequency of scrofulosis and "pulmonary consumption in such cases is caused by other agencies than the "want of fresh air, and especially by bad and insufficient food, does not stand "the test of experience. The inhabitants of many poor villages are on an "average much worse off with regard to food and are exposed to more "numerous causes of disease than those who are detained in prisons and "reformatories, without being in the same degree as the latter liable to these "diseases. Too little regard has hitherto been paid in practice to these "striking facts."† Marques gives an opinion equally strong on this point as deduced from observations on the Portuguese army, which has an extremely bad commissariat. The former absence of the disease among the New Zealanders when first visited by Captain Cook, and its subsequent ravages, have been connected with the departure from their original food of esculent roots and the adoption of a potatoe diet; judging, however, from the analogous case of the North American Indian, a more potent causation would be found in their aggregation, adopting the habits of the white man, drunkenness and syphilis. The indubitable greater excess of the disease among the herbivorous animals of domestication over the carnivorous would tend to connect it with qualities of food. The influence of an improved diet over the general health of a community is well shown by Mr. W. R. Cornish, in the Bombay House of Correction, in the reduction of the sickness and mortality, thus :—under the old and deficient diet, average for 10 years, 1,761 per 1,000 admissions, 64·5

* *Practical Hygiene*, p. 524.

† *Sydenham Translation of Niemeyer's Lectures*, p. 63.

deaths; under the new and improved diet, average for 4 years, 818 per 1,000 admissions, 11·14 deaths, with a proportion of nitrogenous food to carbonaceous as 1 to 3; the same feature characterized the old and new systems of prison life in England.

That the ration of the soldier is superior both in quantity and quality of material to the ordinary food of one of his own station in civil life few will question, while at the same time the average day's duty with tissue wear is no less to his advantage—a decrease of the expenditure of vital force with an excess of pabulum for its renewal and strengthening; hence there is no basis to explain under this heading the predominance of the military disease. There is no doubt also that the recruit rapidly increases in weight and development under it, for example: 21 men taken indiscriminately after six weeks soldiering gave the following variations from the weight on joining,*—17 had increased an average 4 pounds and ranging from 1 to 16; 1 had remained the same; 3 had lost an average 2 pounds from 1 to 3; the necessity also of attention to this as regards the looseness of the recruits' clothes to allow of the body expansion was made the subject of a general order.† But it must be conceded that under the devitalizing influences of tropical climate and its diseases, the soldier may require an amount of nutriment for the support and re-invigoration of his frame above that of the labourer permanently in his native air, and also an excess of easily digested flesh food as compared with vegetable in view of the deteriorated assimilating powers from the frequent gastro-intestinal derangements of the Mediterranean and India; hence, that which is applicable to the recruit does not hold good of the well-seasoned soldier. An opinion so general‡ on the non-sufficiency of the present ration for the requirements of the army at large cannot but be grounded on substantial practical data, and although poverty of food may not *per se* originate phthisis, and may be regarded as decidedly secondary to some potent agencies, yet deficient nourishment tends to intemperance, and want of constitutional stamina is one of the associates of caseation of inflammatory products in the lungs or elsewhere, and certainly predisposes to such agencies as vitiated air, &c.; in these modes the lowness of the amount of nitrogen and fat may indirectly contribute towards the mass of pulmonary consumption, but it must not be lost sight of that the supplying of these deficiencies are within the control of the individual.

Alcohol.—There is indubitably a general tendency in the army to alcoholic abuse in the form of raw spirits. Professor Parkes, while referring to the system, not long extant, of the spirit ration (in force even during the last New Zealand war), by which men were made drunkards in spite of themselves, and to "the yet too easy obtaining of spirits by the soldier, ignorant of their fatal "results on his health," states: "Still the British army has the unhappy "character of the most intemperate army in Europe, and it is certain that its "moments of misconduct and misfortune have been too frequently caused by the

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* The individual weights were as follows, after six weeks' ordinary recruit drill:—

1 gained 16 lbs.	1 lost 3 lbs.	Neither gain nor loss.
1 „ 13 „	1 „ 2 „	1
2 „ 12 „	1 „ 1 „	
2 „ 11 „		
1 „ 10 „		
2 „ 6 „		
1 „ 5 „		
3 „ 4 „		
1 „ 3 „		
1 „ 2 „		
2 „ 1 „		

Some of the recruits who were as low as 31½ in. around the chest had increased to 33 in 3 months.

† Early in April 1872.

‡ This, with remarks, is detailed, Blue Book 1860, p. 256.

"unrestrained passion for drink."* That this system of "dramming"—not generally leading to overt acts of inebriation, yet not the less certain in its results—is extremely common even among the well-conducted and ordinary steady soldiers and non-commissioned officers, few who have seen much of their inner life will question; and although it produces but few hospital admissions for "ebrositas," yet its dire effects when illness and epidemics supervene cannot be over-estimated. Nor is the individual wholly to blame; there are ignorance, want of occupation, and especially the depressing effects of climate and barrack-air to be considered in apportioning the responsibility.

Of the effect of "dram-drinking" on the respiratory functions and tissues, Hammond, in his *Physiological Memoirs*, states that "the carbonic acid and the aqueous vapour were lessened in quantity, which same may be said of all the excretions." Professor Parkes corroborates this, and adds that, "habitually "taken in large quantities, it alters the molecular constitution of the lungs, as "chronic bronchitis and lobar emphysema are certainly more common in those "who take much alcohol."† Moreover, "it decreases strength and impairs "nutrition; it leads to degeneration of tissues of certain organs, especially of "the liver, nervous system, heart, lungs, kidneys."‡ Dr. Marcet deduces from the statistics of disease that "drunkards are much more predisposed to affec- "tions of the respiratory organs than sobers; and that in no other disorders, "except in fever and ague, is this predisposition of drinkers, compared to that "of sobers, so great as in diseases of the air-passages."§ "The fact may be "satisfactorily explained, for the lungs of drinkers being a medium through "which alcoholic vapour pass on their way out of the body, it is but very "natural to infer that a constant state of irritation is kept up in those organs "which, under the slightest exciting cause, becomes a condition of disease; "indeed, admitting this explanation, alcohol might be considered in itself an "existing cause of pulmonary affection." || The sub-division of the statistics into trades points out the same feature—"the comparative predisposition of "drinkers, to the sober men in each employment, to diseases of the lungs."¶

When to the direct results of alcohol on the system and the respiratory membrane be added its engendering quality to diseased action by the recklessness to exposure, diminished sensibility to appreciate external conditions and guard against them, and the predisposing to any current morbid agency, it cannot be questioned that it contributes in a certain degree to the mass of consumption in the army. How far its influence is exerted in maintaining the excess of the military** disease, as compared to the civil element,†† is difficult of elucidation; but it is probable that here also it shows its potency, the tendency to chronic alcoholism—from want of rational employment, and consequent *ennui*—and the means for its indulgence being probably more diffused in the army than in the class from which the soldier is drawn.

Tobacco.—The practice of smoking is as widely diffused in the army as dram-drinking; "chewing," also, is not uncommon. Of the former, "no great "evil appears to result from its moderate use, though no good can be traced to

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* *Practical Hygiene*, p. 284.

† *Ib.*, p. 273.

‡ *Ib.*, 3rd ed., p. 266.

§ Corroborating this is a paper by Dr. Dickinson, read before the Royal Medical and Chirurgical Society, and reported in the *Medical Times and Gazette*, p. 500, for 1872.

|| *Med. Chir. Review*, April 1862, p. 492.

¶ *Ib.*, p. 498.

** Temperance alone is no guarantee against consumption, as the Portuguese Army is probably the least addicted to drink in the world, and yet suffers from phthisis, respiratory diseases, and ophthalmia in a very great ratio.

†† An analysis from this branch, by Dr. E. Smith, is given in the *Med. Chir. Review*, Oct. 1862, p. 436. Sixteen per cent. of phthisis had had syphilis; 38·5 gonorrhœa; 24·5 had drunk to excess; in 70 per cent. there was some complaint as to the injurious influence of their occupation, *e.g.*, exposure, long hours, close and hot rooms, bending posture, dust and fumes, in the following proportion: 32·1, 28·6, 24·4, 20·0, 15·8.

"it."* It lessons the amount of aqueous vapour exhaled from the respiratory membrane. Its effect upon the brain proper (of possible advantage) is that of a sedative—"a solace to the feelings," while that on the system generally is either negative or (not unfrequently) depressant, especially on the heart's action, and then leading to spirit-drinking in the attempt to counteract this influence. With the short pipe, oleaginous and carbonaceous particles, in no mean quantity (evinced by drawing the smoke through a piece of muslin and intercepting these products of tobacco combustion), pass into the air-tubes and vesicles. Beyond the results to the individual smoker, as carried on in the service it tends to vitiate still further the already vitiated air of the barrack-room, especially before "turning into bed." Although perhaps its influence for harm upon the pulmonary tissues is practically small, yet it cannot but assist other more potent agencies. Its practice is not worthy of commendation, decidedly requiring to be kept within limits, and to be carried out elsewhere than in the sleeping-room.

(*d.*) *Barrack Habitation.*—Under the previous headings we have considered general conditions of the soldier's life which may be modified (even greatly) by the branch of the service in which he enlists, the climate he serves in, the option of the individual, and personal qualities; the present comprises a feature common to all, and beyond the disposition of the soldier himself, affecting him in the light of an unit of a mass, company, corps, or regiment—*Barrack Habitation*, embracing site, surroundings, and more especially construction, breathing-space, and ventilation. The nature of the barrack varies—a hut, a storied building, a casemate, neither special to stations nor climates. The surroundings are, as a rule, in a sanitary point of view, fairly respected; the site, as regards enclosure from adjacent buildings, not uncommonly in fault; but these conditions (in view of our present inquiry) resolve themselves into the influence they exert on the habitation-atmosphere of the soldier, the air he has to inspire. The general construction of permanent barracks is that of floors, one above the other, three or four tiers of rooms; as a resultant, "in a barrack, "there is greater compression of the population than in the most crowded "city,"† and "the main concomitant condition of density of population is impurity of air."‡ On the prevailing custom of the division of the floors into large rooms, massing individuals in bodies of 25 or upwards, the Commissioners for India state that, "in their opinion, the mere size of the barrack-rooms are "sufficient to render them unhealthy, notwithstanding the amplitude of "accommodation and the large amount of breathing space allotted to each "man." "An essential condition of each barrack-room is that the air in it "shall be as pure during the night as the air outside; but it is impossible to "ensure this if the rooms are above a certain size and contain above a certain "number of men. Whenever the number exceeds 20 or 30 per room it is "practically far more difficult to ensure fresh air, and beyond that number it "soon becomes impossible," for the reason that "the directions which the foul "air may take in the room depends on accidental circumstances not under "control, which may lead to its being accumulated at one end of the room or "over one group of beds."§ They recommend that "not more than a quarter "of a company should be located in one room." No less applicable are these principles to other climates than India.

The accuracy of this expressed opinion has been practically demonstrated by Dr. de Chaumont, Assistant Professor of Hygiene, in the new barrack for the Guards, at Chelsea,‖ and the infantry barracks at Aldershot.

At Aldershot,¶ in a room for 24 men, with 550 cubic feet each, one part gave 1·154 per 1,000 of carbonic acid, while the farthest end gave 1·285; and in

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* *Practical Hygiene*, 3rd ed., p. 527.

† *Ib.*, p. 529.

‡ *Ib.*, p. 84. "This feature extends also to our system of camps. The least "crowded plans afforded one-twentieth part of the area per man allotted to each "individual of the metropolis. About half the amount of the most densely-peopled "parts of London," p. 520, *Sanitary Commission*, 1859.

§ *Sanitary Commission for India*, 1863, p. 99.

‖ Blue Book for 1867, p. 273.

¶ *Ib.*, 1863, pp. 263 and 271.

the increasing difficulties of ventilation in proportion to floors the following example is quoted:—

Ground Floor.—Total discharge of foul air per hour		32,698	cubic feet.
Middle Floor	„ „	25,515	„
Upper Floor	„ „	9,009	„

Hence in the massing of too many individuals on a given area of ground, in the floors, and in the largeness of the rooms, there are grave defects;* but to extend the inquiry into the available cubic breathing space for each individual, and the atmospheric condition of the rooms, let us look to the features characterizing the period producing the mass of consumption detailed in the first part of the essay, as set forth in the Army Medical Blue Books from 1859 upwards, the which I have arranged in separate years for comparison, and to indicate the gradual progress of sanitary improvements as elucidatory of the tendency to decline in the yearly percentage of phthisis, shown by the statistics as especially apparent in the home segment.

A description of the foulness and overcrowding of the old barrack-rooms needs no recapitulation here, nor its associate of enormous loss from "lung "disease" of all kinds,† acute inflammatory or chronic ulcerative. Immediately prior to 1859, 450 cubic feet per man, when available, were allowed in the permanent barracks. Of ventilation there was none. The features of the period we wish especially to consider were as follows, culled from the yearly records:—

1859.—"Foot Guards located chiefly in London, and with some of their bar-"racks in the most densely-peopled quarters." A general expression as to the overcrowding and absence of all ventilation, both at home and abroad, no station excepted. "During the latter part of the year the new system of "ventilation was introduced in the United Kingdom, in accordance with the "suggestions of the Barrack and Hospital Commission."‡

1860.—An average of 13 home stations gave 464 cubic feet of breathing-space for each man, at Chatham as low as 338.§ The Guards in London averaged 455 cubic feet; at Windsor, 400. Scotland, average of six stations, 414; lowest, at Edinburgh Castle, 302. Dublin, average of 11 barracks, 438; in one only 280. In Ireland generally, 424. Channel Islands, 600. "At the close of this "year the improved system of ventilation introduced by the Barrack and "Hospital Commission had been very generally carried out at stations occu-"pied by troops in England; also the new ventilating fire-grates had been "adopted."

In the Mediterranean, average space 442 cubic feet; as low as 267 in some

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* Excellent observations upon the necessity of superficial area will be found, Blue Book, 1860, p. 325, by Dr. Crawford, D.I.G.; 1863, p. 400, by Dr. Beatson, I.G.; and 1869, p. 231, by Dr. Massey, D.I.G. In the latter the advantages of dispersion and subdivision are clearly set forth.

† A good example of this is given by Dr. Davy, in his *Pathology of Army Diseases*, pp. 164–5. In 125 men dying at the lunatic establishment, Fort Clarence, Chatham, *of all diseases*, the lungs of 20 were normal; in 23 pneumonia or empyema were present; in the remainder some form of tubercle was present; the conditions—"want of light, deficient ventilation, difficulty of warming, better calculated to "engender disease than preserve health."

‡ These extracts are from the yearly Blue Books. Whenever no allusion is made to stations in succession years, it means that no variation has ensued in its conditions since the prior remarks, which holds good until the succeeding change is reported.

§ The associated features of this station is very suggestive. A high range both of respiratory and tubercular diseases in excess of corresponding stations is the predominant character of the sickness. The Commissioner's report, "that the barracks "are the most overcrowded in the United Kingdom; the space allotted to 100 is "sufficient for no more than 57; there are 8 rooms with only 247 cubic feet per "man; 56 with 345; 54 with 281; in 16, 285; in 20, 275. The worst example "of overcrowding was at St. Mary's, where 1,128 men were crowded into a space "sufficient for 600, if the place where otherwise suitable for habitation, which it is "not." They add "it is in vain to expect troops to be healthy so long as these "departures from the law are permitted."—Blue Book for 1860, p. 8.

barracks in Malta. "Bomb-proof rooms in Gibraltar damp, with a partial or "total absence of all ventilation." Canada, "deficient space everywhere;" in "Montreal, 364 cubic feet. Bermuda, "defective accommodation and ventila-"tion." At Nassau, Jamaica, "the best barrack in the West Indies," 600. Barbadoes, 572; St. Helena, 695. Cape, "barrack accommodation very "unfavourable;" in some quarters "quite unfit for the use of troops." Mauritius, "insufficient." Ceylon, "the aspect of the men and the large number "of invalids sent home are adduced as evidence of imperfect ventilation and "ill-drained barracks." India, "in a transitional state, consequent on the large "number of men located there since the mutiny"; at Mhow, 422. Australia, "overcrowded, defective in site and accommodation."

1861.—No marked deviation from former years.

1862.—"At the home stations improvements in ventilation had been effected. "The cubic space varied from the ample occasional 1,000 cubic feet at the New "Barrack, Aldershot, to the 450 of former regulations, and here and there even "under that in some of the older barracks; 600 cubic feet per man being realised "in recent construction of barrack-rooms." In Ireland, "as a whole, the sanitary "and barrack suggestions had not yet been carried out."

Gibraltar relieved by two new barracks, but the garrison rooms are generally described as "in an unsanitary condition and impure atmosphere." Canada, about 600; Cape, 450; Mauritius, 773; St. Helena, 620; India, generally 1,200 cubic feet and 60 superficial area; Fort William, Calcutta, 2–4 storeys, from 1,200 cubic feet and 66 superficial area to 2,000, and 111 respectively.

1863.—"Re-appropriation of barrack accommodation in several stations in "England (including the Guards), Scotland, and Ireland, so as to give 600 cubic "feet per man was ordered by the Commander-in-Chief."

Bermuda, 496; Cape, 240 to 600; Hong-Kong, 651. In Bengal, "at some "stations, sufficient accommodation did not exist, and some degree of over-crowding was inevitable."

1864.—Of the permanent barracks at Aldershot it is observed: "They were "frequently very close at night. The huts, without an extra supply of coal, "are found to be extremely cold in winter; and when their doors and windows "are shut, whilst to a certain extent they still remain uncomfortably cold, "their inner atmosphere becomes at times offensive." Chatham, 500 and upwards; North Britain, 55 square feet and 553 cubic feet; at Leith Fort, 400 and 42 superficial area.

Canada: "Nearly all had the regulated allowance." Ceylon: "No improve-"ments in cubic space or ventilation; from this the Principal Medical Officer "deduces the large percentage of sick and mortality of the white troops."

1866.—Woolwich, under 600 cubic feet. North Britain: "Under 600, but "re-appropriation has been since made." Dublin: "Still under the old scale of "450, but re-appropriation of barracks recommended."

1867.—Woolwich: "The cubic space has been nearly in accordance with "the Regulations." Scotland: "Overcrowding at Aberdeen and Leith Fort."

Condition of the Mediterranean stations not changed. Windward and Leeward Isles: "Additional accommodation necessary, superficial area varying "from 48 to 62 square feet.

1868.—Woolwich: "Overcrowded." Plymouth: "Deficient ventilation." Scotland: "Generally 600; Edinburgh, 582; Hamilton, under 500." Ireland: "From 400 to 500; overcrowding at Cork, and generally in the south-west "district, in spite of re-appropriation of barrack space."

Bermuda: "Far under the 750 cubic feet suggested by the Principal Medical "Officer." Cape: "Too limited cubic space and superficial area." "Improved "ventilation at Melbourne."

1869.—Aldershot: "Ventilating shafts have been introduced into a portion "of the West Infantry Block; the cubic space in barracks and means of venti-"lation otherwise are unchanged." Dublin: "Improved capacity and ventilation "of some of the barracks in the district."

Gibraltar, "over-crowding and ill-ventilation." Malta, "barrack rooms ill-"ventilated and damp, with no means of drying them or warming them in "winter." Jamaica, "500 cubic feet instead of 800, with 75 superficial area as "recommended by Sanitary Commission." Ceylon, "barrack accommodation is very indifferent."

These extracts, when perused will be found to substantially corroborate the statement of Dr. Gordon, D.I.G.,* that "in temperate climates the soldier has seldom more than 450 cubic feet in barracks, while the superficial area varies from 32 to 48." No less apparent is the tardiness in carrying out the recommendations, even in the near home quarter of Aldershot. The foreign stations speak for themselves, deficient in space and ventilation. With the exception of India, a "quieta non movere" principle has prevailed fully, having its counterpart in the unreduced (practically speaking) percentage of phthisis in the statistical list. It is clear that, taking the regulation allowance of 600 cubic feet as a basis, the soldier on the average has rarely reached it in the temperate stations, rarely exceeded it in foreign stations, with the exception of India; and even in the latter country the larger comparative space allowed and obtained does not, in the opinion of competent observers, suffice for the requirements of health†; the general deficiency of ventilation is still only too conspicuous, and, unfortunately, when near the standard requisite for the retention of atmospheric purity, from the smallness of the initial breathing space, currents of cold air are engendered, which lead to blocking up of the apertures on the part of the soldier on every available occasion, and a complete annulling of the derivable benefits.

Turning our attention from the actual breathing space per man to the condition of the air breathed, we shall find examples scattered through the same records in series of experiments carried out from time to time in the barrack rooms of different stations.

During 1861 experiments‡ were instituted in the new barracks at Gravesend. Cubic space per man, 602·7 feet; superficial area, 47·75; area of opening of ventilation, per man, 239 square feet. At 10 P.M., with doors closed, but all apertures for air diffusion open, fires out, 1145·2 cubic feet per man per hour were passing in with a mean velocity of wind externally 2½ miles per hour. On the second experiment, 1,536 cubic feet, with a difference of 4·8 degrees of thermometer between external and internal air, and a velocity of wind, 4·8. The air contained numerous suspended matters, epithelium, cotton fibre, shreds of wool, and amorphous bodies; the carbonic acid, the mean of five experiments, reached 1·25 per 1,000, and this in a barrack-room which is stated to have possessed "every advantage that modern skill can suggest."

In 1863, Dr. de Chaumont carried out an elaborate inquiry into the rooms of the infantry permanent barracks at Aldershot.§ His summary is, "the "carbonic acid, even in the daytime, amounted to more than double the normal "amount, whilst at night, when the rooms had been slept in for some hours, "it rose to nearly four times. The rooms may be said to be quite unven-"tilated."

In the same year observations were made upon the barrack air in Malta,‖ and in the Blue Book for 1864 are detailed the experiments at Hilsea by Dr. de Chaumont, and in 1865 the results of an inquiry at Netley.¶

The new barracks at Chelsea were made the subject of inquiry by Dr. de Chaumont in 1867.** There was a discharge, per head per hour, of 1,770 cubic feet, and the ratio of carbonic acid averaged ·720.

These observations were made in winter, and under very favourable circumstances for ventilation. The men complained of "too much wind." One-fourth of the occupants were absent, yet parts of the rooms varied in the amount of carbonic acid from ·496 to 1·059 per 1,000. The upper floor was very conspicuous in sanitary defects compared to the three under floors. The comparative purity of atmosphere here depicted rarely falls to the lot of the soldier, but let it be observed that it was only attained by an average initial space of 833 cubic feet per man, with very favouring circumstances of external

* *Med Chir. Review*, 1871, January, p. 155.

† Mr. Webb, quoted by Dr. Parkes, *Practical Hygiene*, 3rd ed., p. 314.

‡ By Assistant-Surgeons Hewlett, Stanley, and Reed. Blue Book, 61, p. 380.

§ Detailed in Blue Book for 1863, p. 261, *et seq.*

‖ *Ib.* p. 495.

¶ Blue Book for 1865, p. 467, by medical candidates Mackenzie, Notter, and Nanney.

** Blue Book, 1867, p. 265.

air, and with ventilation amounting to "draughts." The observations are valuable rather as indicating *what may be*, than *what is*, an ordinary barrack atmosphere, for it is too much to expect from the soldier occupying such rooms, but that he will employ every opportunity to exclude the "too much wind" by every available means of ventilator shutting; in fact the principle of obtaining purity of atmosphere by such means cannot be too severely censured, it is antagonistic to the sense of the individual concerned, and leads only to opposition.

Considering that at ·6 of carbonic acid per 1,000 of air, foulness to a deleterious degree is existent, a perusal of these experiments will show how rarely this low standard was present even in those barracks which from construction and cubic space per individual may fairly be considered under the class of most favourable. Here the average would represent at least two-and-a-half times an excess above normal, with a clear initial space of 680 cubic feet, and from it we may deduce that the prevailing condition of barrack atmosphere throughout the period 1859-69 was one of marked impurity. It must be remembered also that when approaching purity was observed, it was obtained at the expense of conditions only a few degrees less deleterious than the foulness of atmosphere which constituted the main point of opposition.

But, setting aside for the moment the actual cubic space characterizing the last ten years, with the accompanying vitiation of respiratory air, let us consider in what condition the soldier is placed provided he obtains that which the regulations are supposed to guarantee him. By the law he is allowed 600 cubic feet of empty space, which on occupation is diminished to 587, by deducting 10 cubic feet for bedding, &c., and 3 cubic feet for the individual himself; an inlet area of 10 square inches, and a total of 16·13 inches outlet, according to circumstances. Further, that he should have 1,200 cubic feet per hour for respiration by the changing of the original empty 600 twice by means of ventilation. Taking ·6 per 1,000 expressed in carbonic acid as the point beyond which vitiation should not go, and calculating from the individual amount of exhalations, Professor Parkes concludes "that 3,000 cubic feet per head per "hour is absolutely necessary for each healthy adult male";* and adds, "I "have measured the air passing out of barracks, and found that when 1,200 or "1·400 cubic feet per head per hour only were given, the carbonic acid reached "·7, ·8, or ·9 per 1,000 volumes, and that more than 2,000 cubic feet were "necessary to keep the air pure to the senses."† Again, on the point of air-changing, he remarks, "three or four times per hour is, I believe, generally all "that can be borne under the conditions of warming in this country; and if "this be correct, from 750 to 1,000 cubic feet should be the minimum "allowance of initial air-space,"‡ *i.e.*, to reduce the carbonic acid to ·6 per 1,000 volumes, not purity. "In this country, a size of 24 square inches per "head for inlet, and the same for outlet, seems calculated to meet ordinary "circumstances."§ Dr. de Chaumont also, in his deductions from the practical experiments at Aldershot, observes, "that it is of paramount importance that "24 square inches of outlet area per man shall be afforded."‖ The application of these facts shows, that, both in initial space, and inlet and outlet area, the regulation allowance falls short of healthy requirements, and that the amount of air required per head per hour could only be obtained by draughts and necessary coldness of temperature suggestive of the avoidance of Scylla by running into Charybdis. The practical experiments also indicates, that, when the conditions were equivalent to that allowed by the regulations, a foulness expressed in 1· per 1,000 of carbonic acid was not uncommon with 680 cubic feet, the average being 1·11 per 1,000; yet it is quite certain that the soldier at home rarely obtains the initial space of 600 cubic feet, and, consequently, impurities in excess of 1· per 10,000 must rapidly augment in inverse proportion to the reduction of the breathing space from this standard.

It is demonstrable, that the actual amount of respiratory air at the disposal

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* *Practical Hygiene*, p. 123.
† *Ib.* p. 121.
‡ *Ib.* p. 124.
§ *Ib.* p. 134.
‖ Blue Book, 1863, p. 272.

of the individual soldier in barracks has been, and still is, far below the requirements of health, entailing marked vitiation; and this is a feature dominant at home and abroad (perhaps in a minor degree in India), and characterizing all segments of the service, though in varying degrees of intensity.

Hence, under the heading of "Barrack habitations," we include as grave defects:—

(*a.*) Over population of the embraced ground area;

(*b.*) Over-largeness of the rooms, by which ventilation is rendered difficult, and consequent on which respiratory exhalations from the many accumulate to mutually react for deleterious influence on the occupants;

(*c.*) Deficient initial cubic space, and, consequently (at least in temperate climates), an impossibility of obtaining the necessary amonut of required air per hour without engendering draughts and cold currents.

These individual items of deleterious conditions concur to form a compound unquestionably potent as an agent of pulmonary disease.

In judging its influence we must especially bear in mind what the barrack room actually is to the soldier. It is never vacated: common to a large number, and not uncommonly the only place of resort except the canteen, more or less of the men are invariably present in it engaged in some one or other occupation; when the soldier leaves the parade he returns to it; it is a day room, a dormitory, the bedclothes, unaired and with the foulness of night accumulations, are rolled up and retained in it until required for use the succeeding evening; eating, smoking, clothes' and accoutrements' cleaning all go on in it; as soon as darkness sets in the combustion of candles or gas add their impurities to that of the pipe and respiration before the soldier "turns in," at a given hour, to bed, when the urine tub not uncommonly further assists. Hence no opportunity exists for the thorough dissipation of the night's impurities before they are renewed; vitiation to a varying degree is constant, and the soldier must pass the maximum hours of the day in it.* The room is ordered to be washed once a week, dry scrubbed on the other days, practically it is swamped in water,† and then an attempt to dry it is made by a large fire; this excess of moisture cannot but add to the general comparatively high hygrometic state of the air, intimately associated with the organic vapours and acting apparently as their vehicle. The thorough dispersal of the organic matter of night, so difficult to get rid of‡ by flooding the room with air for several consecutive hours by window opening, is not practicable under existing circumstances. A barrack-room atmosphere may be regarded as moist and foul, with the occasional adjunct of warmth.

We may class the sources of vitiation as under:—

(*a.*) Pulmonary and cutaneous exhalations;

(*b.*) Products of combustion from lights, fires, and smoking;

(*c.*) Organic emanations from meals;

(*d.*) Particles of material from clothing, furniture, &c., and inorganic matter from cleansing of accoutrements, dust of floors, &c.

We have, then, in vitiated air of dwellings, gases, watery vapour, organic, textural, and mineral particles, as points for consideration in the elucidation of its operation upon the lung parenchyma in the production of pulmonary consumption.

Having thus seen that overcrowding (by which I more especially mean the

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* On this point the Commissioners for 1859, p. 10, states:—"He spends much "of his time in the barrack-room or canteen; this brings the soldier within the range "of comparison of trades but partially carried on in the open air."

† This practice of throwing a considerable quantity of water on the floors, leading to an accumulation of damp and consequent decomposition, is pointed out in Blue Book for 1860, p. 206.

‡ "Many hours free ventilation will not remove the excess, probably because "this adheres to the walls, clothes, &c., and is oxidized rather slowly." Blue Book for 1860, p. 345. Remarks by Professor Parkes.

sanitary, not the regulation,* sense of the term) is the one great common feature of army service, shown in the accumulation of too many individuals (by floors in barracks) on a given surface area, and deficient respiratory space for each individual, and intensified by difficulties of ventilation from largeness of the room and deficient air-delivery ; remembering also that in the vitiation of the air we have elements accumulated indubitably deleterious in their effects on the respiratory surface, that in the barrack habitation we have a condition capable of being linked as cause to effect to the lung disorganization ; let us ask, before inquiring into the *modus operandi*, in what position is the soldier placed as compared to his civil brother ?

"The minimum standard of cubic capacity for poor tenements, usually "adopted by the Metropolitan Office of Health, taking adults and children "together, is 300 or 400 cubic feet per head, an allowance which it is quite "practicable to enforce, and which the police magistrates accordingly have "enforced over and over again." "The minimum cubic space demanded in "workhouse dormitories by the Poor Law Board is 300 cubic feet.† "The "pauper in the Scotch workhouse is allowed 480 cubic feet as a sleeping space, "but is generally above this from seldom being fully occupied ; he is never in "his dormitory during the day."‡ All these presuppose a complete distinction between the rooms occupied during the day and those used for night only, and hence, allowing for the latter complete flooding with air during the long unoccupied hours. Against this average 350 cubic feet of minimum space, adults and children commingled, required by the law for civil life, is the average 450 cubic feet which the soldier gets in temperate climates, all able-bodied adults. "A barrack is more densely populated than the most crowded city ; " as a rule, rarely excepted, the civil dwelling is relieved of most of its inmates during the day by the employment elsewhere of the youths and adult males ; there is the separate dormitory, and the smallness of the rooms allows of free occasional window ventilation when not occupied. On the other hand, the barrack room is never empty, and used for all purposes, large and impeding consequently air-dispersion, never rid of impurities, the soldier must occupy it the major part of the day. The balance is decidedly adverse to the soldier, and in no point more so than the constancy with which he inspires the barrack air ; in this respect there is an undeviating monotony, broken only by his duties on parade or guard, and this is too frequently a change from air vitiation to chest constriction. With certain modifications, the statement before the Sanitary Commission in 1858 is no less applicable to the present day, "that a soldier never knows a healthy home as regards air and space till he commits some crime which brings him into the thoroughly ventilated cell of a military prison."

Summary.—Concluding from the statistics that the associated conditions of the inflammatory phthisis were to be sought mainly in the immediate surroundings of the soldier, we have taken in detail those features common to him as a class, and have endeavoured to ascertain the probable effect of each on the consumption list, and by comparing each with that pertaining to the equivalent class of the civil community, have sought to elucidate their actual influence in the production of the excess of disease in the military segment. The special branch in which he enlists modifies such condition as "pack wearing," accoutrements, &c. ; the clothes are partially dependent on the climate in which he serves ; individually his habits tell in the dissipation of *ennui*, smoking, dram drinking, and fornication ; he can add to his food ; if well-conducted, in time, the option of marriage may be at his disposal ; but he cannot avoid the habitation of a barrack. On such points as food, material of clothing, nature of work during peace, comparative absence from all pecuniary cares, or those of household or family, the soldier is very advantageously placed compared to his civil equivalent ; his chest constriction, barrack life, and foreign service place him at a disadvantage. Of the features of army life we have considered, in the production of general deterioration, are ranged—

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* The frequency with which the *requirements of the service* set even the regulated allowance aside is too common to need any details.

† *Med. Chir. Review*, April, 1865, p. 298.

‡ Extracted from evidence before Sanitary Commission for 1859.

celibacy, night-work, *ennui*, alcoholism, partial defects in diet; in direct pulmonary implication, chest constriction, alcoholism, barrack-overcrowding. The latter is unquestionably the most prominent and potent—it is the great distinguishing feature in the comparison of the period 1837-46 with 1859-69; it is the "one condition common to all which seems capable of explaining"* the prevalence of lung disorganization, and up to the present date has been inseparable (though greatly modified) from military service.

The enlisted man, of the average age of 19 years, is at once brought under the influence of barrack-room atmosphere, and at once, as seen by the table (p. 157), the lung lesion appears among the mass, and progresses in ratio to the length of service. As compared with the civil population, "from 20 to 30 "years of age the mortality in general is favourable to the soldier, but after "that the proportion is reversed;"† between 5 and 10 years' service (corresponding from 25 to 30 years of age), the mortality and invaliding in the Foot Guards from phthisis is excessive, and throughout the service generally, very great, making up the major part of the loss; thus, while the general conditions are advantageous to the soldier, the special phthisical causation is so antagonistic; how clearly do these facts connect the disease with the circumstances of military life and its universal features! Whatever germs may be latent or overlooked at the time of enlistment are developed under the fostering influence of vitiated barrack air. These probably furnish the examples of lung disorganization during the first‡ and second years of service; but, independent of these, are those actually *generated* and represented in the list from two years and onwards in gradually progressing ratio. Equally as the one viscus of the thorax—the heart—gives way and deteriorates under training with the pack, so does the double organ of respiration disintegrate from impure respiration, the concomitant of barrack overcrowding; this segment of the body bearing the overwhelming stress of the conditions of military life.

Having arrived at the conclusion that the main stratum of consumption in the army has an agency in the impure air of the barrack-room,§ what data gleaned elsewhere support the hypothesis, and what is the rationale of the action of vitiations upon the pulmonary textures?

Data corroborating the deduction of the connection between air vitiated by overcrowding and lung disorganization.

The Statistics of other Armies.—Phthisis would appear to be *par excellence* the chronic scourge of standing armies, in all in advance of the corresponding civil class, with the exception of the old Hanoverian; and as a corollary to this, we find this feature linked with the greatest cubic space in barracks of any soldiers in Europe, 700 to 800 initial cubic space as compared with the regulated allowance of 600 cubic feet in the English, and 495 of the Prussian. The one common feature of barrack life is barrack habitation, and in all, the lung lesion is the most prominent cause of loss. The intimate connection between the bronchitic, pneumonic, and phthisical lesions in the Portuguese army, as set forth by S. Marques, has been already referred to, as well as the predominence of all in large towns, and the association of the two latter with foul air; in the French army consumption "progresses in frequency with length of service."‖

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* *Practical Hygiene*, p. 538.

† *Ib.*, p. 534.

‡ In the Blue Book, 1870, p. 48, consumption is shown to be the main cause of loss in the mass of men under one year of service.

§ Valuable remarks on this subject are quoted from Dr. Muir, I.G., in the Blue Book for 1866, p. 56. "The ill-effects of impure air are not very perceptible in "private houses where the inmates are few; but when 30 or 40 men are put up in a "single room, where they take their meals as well as sleep for six or seven months "consecutively, there can scarcely be a question that the seeds of grave disease, espe-"cially consumption, are laid, although the necessary connection between cause and "effect may not be at once traced. I cannot help thinking that the large number "of men treated and invalided for chest disease during the five years I have been "in this command (Canada) bear a close relationship to this impure state of barrack "air."

‖ *Practical Hygiene*, p. 535.

Owing to the peculiarity of the enlistment, and the conditions associated with a military life in the British, as compared with other continental armies, a contrast of details of disease, and the several agencies in operation, could not be expected to lead to reliable conclusions, so many variable and modifying influences being in action to oppose such results, and hence is not attempted.

The naval details.—In the Navy, consumption is somewhat less than the Army—an annual average loss of 6·5 per 1,000 of strength against 7·15 in the Army; and, according to the statistics brought forward by Dr. Balfour, D.I.G., in his comparison of the two services, decidedly less among the sailors at home, but reversed in the Mediterranean where the advantage is on the side of the soldier. Diseases of the respiratory organs are the most prolific source of sickness and loss, causing one-sixth of the total sickness and one-fifth of the total deaths, against one-third of the latter in the army; hence the soldier gives the maximum loss by deaths from inflammatory chest affections, equally as from the chronic lung destruction.

On the universal distribution of the disease, independent of climate, the statistics from the stations of the fleet completely support the army deductions. Dr. Milroy adduces instances of the immunity of one ship as compared with others, equal duties, same station, and connects the disease with overcrowding and defective ventilation. In many respects the navy is in accord with the sister service. The sailors are chosen men, free from disease, they are well fed and clothed, they serve in all climates, they suffer markedly from like diseases; on the other hand, syphilis is less rife among them, they are free from all chest constriction by clothes or accoutrements. As with overcrowding in barracks, so "everything indicates that the master sanitary defect in our "ships of war is the insufficient accommodation for the men, and the consequent "excessive crowding of them at night in the lower and worst aired decks." "The other great hygienic evil is intemperance."*

Civil population.—It is not necessary here to extract largely from the medical literature on the subject, showing the excess of phthisis in workhouses, asylums, gaols, &c., but rather to cull such observations as seem more especially applicable to the conditions of the special class the consideration of the disease among which is the subject of this inquiry. The preponderance of consumption in the death-rate of towns over that of the country districts is exemplified in every capital in Europe. Dr. Greenhow, in his inquiry into the causes of pulmonary disease,† points out how opposed deductions may be derived from the statistics of countries, towns, aggregation of inhabitants, sex, &c., unless the intimate surroundings of the sufferers be taken into consideration; "the "country labouring-class dwelling in separate cottages may present a smaller "superficial density of population, and yet, from deficiency of space within "the dwellings, their inhabitants may suffer from all the worst evils of an over-"crowded population." Mr. Simon states—"In proportion as the male and "female populations are severally attracted to indoor branches of industry, in "such proportions, other things being equal, their respective death-rates by "phthisis are increased." ‡ On the limitation of the disease to special classes may be quoted the following pertinent remarks. "While it was at one time "alleged as an argument in favour of the suitability of Egypt for consumptive "cases that phthisis was almost unknown in that country, subsequent researches "have shown that the disease not only exists, but is very prevalent in many "parts of it; it occurs principally among the Copts, Berbers, negroes, and "other denizens of southern Egypt, who are imported to fill the harems or "augment the forces of the Viceroy, and who are thus exposed to all the "prejudicial influences which attend the exchange of a warm climate for a "colder one, of a wandering out-door life for the unwholesome conditions of a "seraglio or barracks, and above all of freedom for slavery."§ "Among the "Jew population in Algiers, while, during a period of eight years, the general

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* *Med. Chir. Review*, 1862, January, p. 111.
† Quoted in *Med. Chir. Review*, January 1859, p. 11.
‡ *Ib.*, p. 8.
§ *Med. Chir. Review*, July 1862, p. 67.

"mortality, as compared to that of the Christians and Mahommedans, was in "the ratio of 2·75 to 4·22, the deaths from phthisis were to those amongst the "latter in the proportion of 7·22 to 7·06." "The immunity which the Arab "enjoys from phthisis while at large, in the freedom of his nomadic life, is "most painfully in contrast with the ravages which it commits among the "native troops of the Dey and the native inmates of the prisons." "M. de "Pietra Santa states that, out of 600 natives confined in the prison of Nismes, "nearly 250 died of consumption in a very short space of time, whilst in the "central house of El Harrack, out of 153 deaths 75 arose from phthisis. One "of the Arabic names for consumption is meurdh-el-abid, or the slaves "disease."* Burton notes also the prevalence of "pneumonia, asthma, and "consumption" at Zanzibar, and remarks that "the latter is aggravated by "the humid atmosphere," also that "all are more frequent among the higher "classes, especially the Arab women debilitated by over seclusion."†

"Baly, in his observations on the prevalence of the disease at Milbank, "draws a comparison between the mortality there recorded and that in London "generally, and shows that phthisis is three times more prevalent in the "prison than the metropolis, the large majority having contracted the disease "after their admission."‡ "Of 104 compositors who worked in rooms of less "than 500 cubic feet for each person, 12·50 per cent. had had hæmoptysis; "of 115 in rooms having from 500 to 600 cubic feet, 4·35 per cent.; and of "101 in rooms of more than 600 cubic feet, 1·98 per cent. had suffered."

Professor Aitken quotes Pollock, who sums up: "It must then be "admitted, from overwhelming testimony, that deficient ventilation and "crowded apartments are eminently productive of tubercular disease. Those "trades which, by mechanical hindrance to the free entry of air into the lungs "restrict the expansion of the chest wall, and result in imperfect performance "of the respiratory function, and consequent interference with the proper "nutrition of the pulmonary tissues and general lessened vitality of the system, "furnish no doubt a large proportion of cases of tuberculosis."§ The application of such evidence to the overcrowded barrack-room, and the soldier subjected to chest constriction by clothing and accoutrements, is palpable.

Tending to the elucidation of the agency of organic vapours and particles inspired, are the following extracts. "Much importance is assigned to the "injurious effects of dust from animal tissues, such as skins, and the tables show "that saddlers, furriers, glovers, and tailors, are very consumptive." "The "dust of minerals is equally noxious."‖ Lombard pointed out the influence of varnishes, turpentine, and drying oils in developing phthisis; "among work-"men who use solder, such as tinmen, goldsmiths, coppersmiths, the disease is "very common." "Those who work in a humid atmosphere, or with moist "materials, are among the least prone to suffer."¶ Sir J. Clark refers to "the "influence of those trades which expose the workmen to an atmosphere loaded "with pulverulent bodies, or charged with gaseous substances of an irritating "quality and their deleterious action on the respiratory organs." He quotes Mr. Thackrah and Dr. Forbes on the prevalence of bronchitis among them, and considers that the consumption is "induced mainly through the bronchial "irritation."** Dr. W. Fox states that "it is doubtful whether irritating "vapours can produce true lobar pneumonia; they may, however, produce a "disseminated form closely resembling the lobular pneumonia occasionally "occurring in bronchitis."†† The pathology points out the frequency of these prodromes in the army forms of phthisis.

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* *Med. Chir. Review*, July 1862, p. 73.
† *Zanzibar*, vol. i., p. 194.
‡ *Med. Chir. Review*, July 1868, p. 36.
§ *Practice of Medicine*, vol. ii., p. 21.
‖ *Med. Chir. Review*, October 1862, p. 429.
¶ *Annales d'Hygiene Publique*, tom. xi., p. 45.
** *Pulmonary Consumption*, p. 185.
†† *Reynold's Medicine*, vol. iii., p. 616.

The rationale of operation of Respiratory Impurities.

We have seen that the main constituents of the vitiated air of dwellings are:—

(*a.*) Certain gases (chiefly carbonic acid) and watery vapour;
(*b.*) Organic matter—vaporous and molecular;
(*c.*) Foreign particles—organic and inorganic;

the influence of these by re-entry with the inspired air, their action on the lung textures directly with the nature of the change induced, and their subsequent results to the body at large, are the points which chiefly concern us here.

(*a.*) Of the gases present we may practically ignore all but the carbonic acid, for although carbonic oxide, sulphurous acid, and sulphurretted hydrogen may be present and sufficiently noxious when in large amount, yet to the extent to which they are met with in the ordinary impure air of dwellings, their influence is but of minor importance. Any gaseous bodies would doubtless be directly absorbed, and passing into the circulating fluid, would produce results of a general character. Of the carbonic acid *per se* there does not appear any grounds for supposing that it has any direct deleterious agency upon the lung tissues, beyond that liable to ensue in common with all the other body structures, from its retention in the blood and general impairment of nutrition. Its presence in excess in the air inspired must necessarily impede the normal interchange in the act of respiration between the air entering and the blood circulating, and consequently must not only cause an accumulation of this gas as an effete product in the body generally, but by the impeding the respiratory function, the efficient performance of which is one, if not the main producer of the pulmonary capillary circulation, must tend also to the engorgement and stasis of blood in the walls of the air cells, and by the prolongation of such a condition must eventually render the lung textures extremely prone to morbific agency, as well as favour the growth and formation of low mucoid and epithelial forms, the retention of which in the air passages are so potent for evil. Thus the influence of this gas in the amount usually present is rather in the nature of a predisposer to disease in the pulmonary vesicles than as a direct agent.

In much the same way would the excess of watery vapour act; according as it approached saturation, so it would tend to impede the exhalation from the lung and favour congestion; beyond this also, the intimate connection between the organic matter and hygrometic bodies must not be forgotten.

(*b.*) The grand deleterious influence of vitiated air is unquestionably centred in the organic matter. Professor Parkes states, "from experiments on animals, "in which the carbonic acid and watery vapour were removed, and their com- "ponent alone remaining, Garanet and Hammond found it highly poisonous, a "mouse dying in 45 minutes."* He draws attention to the febrile state produced by its inspiration; its fatal action in a more concentrated form, as in the Black Hole of Calcutta, the symptoms "being not those of pure asphyxia, but "due to a poisonous agency"; while in more moderate amount it induces "general pallor, deficient appetite, and decline in muscular strength and "spirits," and in the list of its special influence he gives a great prominence to "pulmonary affections." Another observer remarks, "there is strong reason "for believing that putrescent matter in the air exercises its pernicious in- "fluence, not by reproducing itself in the living organism after the manner of "a specific virus, but by depressing and impairing the functions of the whole "body, and particularly of those organs with which it is brought into contact, "manifesting itself constitutionally by fever accompanied by prostration; "locally by affections of the respiratory and digestive mucous membranes."† Passing into the air vesicles with the inspired air, the organic matter would doubtless be stopped by the respiratory membrane stretched between the external air and the capillary network, with a primary effect on the delicate structures of the air vesicle, the epithelial lining (presuming that it exists), and the fibrous tissue elements. The clinical history and pathology of the varieties of consumption induced would lead to the inference that its effects are gradual,

* *Practical Hygiene*, p. 103.
† *Med. Chir. Review*, October 1861, p. 441.

irritating, and antagonistic to normal nutrition, leading to impairment of function of the ultimate molecules, diminished elasticity of the capillary walls with tendency to dilate or rupture, proliferation of the epithelium cells of the air vesicles and broncheoles, with aggregation of them into a mass ultimately undergoing the tyromatous change, and giving the characteristics of "crude "yellow tubercle" in the lung textures. But not only in this direct way, but also in the light of a strong predisposing agency would organic matter impress its influence of the pulmonary textures; these already molecularly deranged and morbidly inclined would fall an easy prey to climatic variations and minor causes of pulmonary or bronchial inflammation. In the words of an article in the 'Lancet,'* "the constant breathing of an 'organic atmosphere' in a climate "like that of Great Britain would be very likely to predispose soldiers to those "destructive pulmonary lesions that so closely resemble consumption, but "which, according to a strict pathology, could hardly be classified under tuber-"cular phthisis." Hence we may regard the action of the organic matter as local and general; upon the lung textures directly, by antagonizing normal textural nutrition, and through a sub-acute inflammatory process in the air vesicles leading to development and accumulation of cell forms ultimately to retrogress; strongly predisposing to minor agencies of disease, and such hurtful conditions as chest constriction from clothing and accoutrements; secondarily, upon the system at large through the products of disease in the pulmonary tissues, by impairment of the respiratory function, accumulation of effete materials in the circulation by absorption of degenerate elements causing that condition of the system expressed as "marasmus"; and by acting as a focus of infection for the development of those adenoid outgrowths known as "miliary tubercle," first in the surrounding pulmonary parenchyma and subsequently in the body generally (tuberculosis).

(*c.*) On the presence of organic and inorganic particles in barrack-room air, Staff Surgeon Watson, contrasting the general atmosphere with the enclosed space within buildings, remarks† of the latter, "a marked difference was at "once observed between the products of the air of the room and those of the "experiments on the outer air; vegetable matters were less abundant, mineral "particles not so numerous, probably because in the stiller air of the room they "tend to fall rapidly; whilst irregular amorphous molecules were in greatly "increased numbers, and epithelial scales, single and in tesselated masses, were "found in plenty. The examination also showed cotton, linen, and wool fibres "from articles of clothing, dyed of various colours, ragged nondescript frag-"ments, possibly from the same source, bits of human hair, a very few spores "of fungi and broken filaments of mycelium; but perhaps the most distinguish-"ing characteristic of this result, as compared with that of the outer air, was "the existence in considerable numbers of round yellowish cells not unlike "mucous corpuscles, but much larger, usually globular, at times with a "nucleus, and in one or two examples, presenting a slight prominence on one "side."

The possibility of particles passing into the air cells is proven distinctly by the experiments of Knauff; of the lung lesion associated with trades, and those in which more especially mineral fragments are cast off, Dr. Greenhow sums up, "these mechanical particles inhaled into the air passages set up in the first "instance more or less irritation of the bronchial membrane; a continuance "rarely fails sooner or later to induce those changes in the interstitial tissue of "the lungs, consisting of bronchial dilatation and peri-bronchial fibroid indura-"tion, thickening of the walls of the air vesicles, deep pigmentary accumula-"tion in the tissue, vesicles, and cells, interstitial pneumonia and accumulation "of blood cells and inflammatory cells in the air vesicles."‡

The larger irritating, and the metallic particles would appear to settle in the air passages, not reaching the vesicles, hence inducing tubal inflammation; on the other hand, the more minute and soft organic particles, from cotton and woollen fabrics, emanations from varnishes, &c., would seem generally to pass at once beyond the tubes into the cœcal extremities—the air vesicles, there to

* Number for January 13th, 1872

† Blue Book for 1869, p. 531.

‡ *Pathological Society's Transactions*, vol. 20, p. 51.

induce pneumonic lesion; these latter agencies predominate in barrack room atmosphere, and these latter morbid products are in excess in army pathology. The results upon the body at large of the induced lesion are markedly local; on this point, in a review* of the health of the mining population, it is stated, "the inordinate prevalence of lung disease among them is clearly shown, but "in reference to the occurrence of scrofulous affections arising among the miners "and their families, they are said to be decidedly rare"; as the result of one inspection, the observer remarks, "I have never seen a more healthy set of "children collected together, and did not detect a single child with swelled "glands or other signs of scrofula."

Before leaving this heading there is one point requiring notice, and it is, the constant presence of large quantities of epithelium as an ingredient of barrack air, no less remarkable in the wards in which phthisical patients are collected. The opinion that lung disease is contagious is wide spread and practically acted on; the presence of lung disorganization among soldiers often well advanced on detection has been shown in Part I. of the essay, as well as its oft occurrence in men not recognized until death by other disease; constant emanations from the lungs of such individuals into the general barrack room atmosphere must be present, and the question arises as to the connection between these vitiations (epithelial?) and the origin of disease in the healthy. As far as I am aware but few data exist upon which to ground a deduction, analogous exfoliations from the conjunctival membrane and the dispersion of the affection suggest a like causation in this disease, and would strongly support a segregation of phthisis victims from the general mass.

Climate.—A scrutiny of the earlier and later periods of the army statistics of the present century will dissociate climate as a direct agency, and the major part of the pulmonary consumption of the military segment. Professor Maclean, C.B., on this point remarks ("Army Blue Book," 1870, p. 313):—"The statistics of the British Army have done much to explode the vulgar "belief that phthisis is peculiarly a disease of cold climates. The large con-"tingents of phthisical subjects contributed from India, from the Mediterranean, 'from the West Indies, point to the fact that something beyond merely climatic 'influence is required to secure immunity from the scourge of armies." We have deduced the main causation of the greater portion of the total mass of disease n overcrowding; but granting this hypothesis, can we entirely exclude from consideration such a composite factor as climate in the elucidation of etiology, the fluctuations of disease, and predominence in the medium zone of temperature over the extremes of the thermometer? Are there no modifications in the "hygienic conditions under which the varieties of consumption occur" dependent on heat range, rapid fluctuation, hygrometric qualities of the outer air? In sum, does climate as a cause of lung disorganization stand at zero, and if not, is it directly or indirectly concerned in generation?

Fuller on the distribution of the disease observes:—"Of all countries of the "world there are none so exempt from the ravages of consumption as those "which are included in the isothermal lines of 30° and 40° Fahr. mean annual "temperature. In St. Petersburg and Moscow, with a mean annual tempera-"ture of about 38°; in Canada and the northern districts of North America; "in Iceland and in the Faröe Islands; and in the northern parts of Norway, "Sweden, and Lapland the disease is comparatively rare; whilst in France, "Italy, and along the shores of the Mediterranean, in Malta and Madeira, and "other localities to which consumptive invalids are usually consigned, the "ratio of mortality among the natives from phthisis equals, and in many "instances exceeds, that which obtains in many parts of our own country."† "In Canada, Fort Kent, Maine, with a mean temperature of 35·8 Fahr., and "where quicksilver freezes in winter, phthisis rarely occurs; in the south "temperate zone, including Australia, Van Diemen's Land, and New Zealand, "which is in general so distinguished for its salubrity, phthisis is one of the "five most usual affections, the others being dysentery, pneumonia, catarrh, "and ophthalmia."‡

* *Med. Chir. Review*, April 1865, p. 368.
† *On Diseases of the Chest*, p. 417.
‡ *Med. Chir. Review*, January 1859, p. 66.

Here, then, are concurrent opinions in accord with the army statistics and showing that consumption is in the ascendancy in temperate climates and diminishing towards the extremes of heat, cold evidently being antagonistic, warmth favourable.

If now we break up the climatic ingredients we observe as follows,—"Phthisis would seem to be extremely rare in the higher mountainous regions "with a decreased pressure of the air, the actual altitude necessary varying in "different latitudes and becoming lower as we approach the poles—tropical "7,000 feet, warmer temperate 3,500 to 5,000 feet, colder temperate 1,300 to "3,000".* Dr. Mattocks, from the census returns of the United States for 1860, shows "that the disease diminishes from the moist east to the dry west, "and still more rapidly from cold north to warm south. Cold and moisture "combined develope consumption fearfully where there is a predisposition and "without it in many instances, but break up as it were this deadly "combination, and we remove the fangs of predisposition." Hammond observes that "a very dry atmosphere is most conducive to the prevention of "the disease and to its cure in its incipient stage, and this though the cold may "be great in winter and the temperature high in summer."† "The "observations of Buchanan and Bowditch also show a connection between "phthisis and the soil moisture; the death rate from this disease in various "towns in England having greatly fallen in consequence of efficient land "drainage and removal of the subsoil water."‡

From these we may educe that the main deleterious property of the general atmosphere is moisture, and very potent when relatively great and combined with cold—a feature mainly pertaining to the temperate zone, and here also associated with variability.

We know that, equally with chronic lung destruction, the temperate zone carries with it in both hemispheres an excess of respiratory lesions; and with these two varieties of lung disorganization are linked—the acute pneumonic and the catarrhal; hence it is impossible to ignore climate as a direct agent. We have remarked also the predisposing quality of vitiated air by rendering the pulmonary textures ultra-sensitive to external agencies; here a damp variable climate such as Great Britain is met midway by hygenic defects of dwelling and indirectly responsible for structural lung disease. Great relative humidity is antagonistic to aqueous, cutaneous, and respiratory exhalations, and the organic matter is intimately bound up with the watery vapour which acts apparently as its vehicle. We know also that moisture is essential to putrefactive changes, that cold retards by congelation and heat by dessication; that it is more necessary to regard foulness of air in warm climates than cold—an amount innocuous in an Esquimaux hut§ verging on pestiferous in the tropics. Again, in proportion as it is necessary to guard the surface of the body against variability, does climate become indirectly responsible for lung lesions.

On these grounds it is impossible to divorce climate and consumption. But there is another point in which we must regard it, pertaining to the military segment as contrasted with the civil. The soldier serves the greater period of his engagement in the tropics and although the European, under good general and personal sanitation, may enjoy health and strength in the higher temperature zones of the earth, yet the practical results as expressed in a body of men, such as a regiment, returning from India is not reassuring. Anæmia,

* *Practical Hygiene*, p. 468.

† Quoted by *Med. Chir. Review*, April 1864, p. 400.

‡ *Practical Hygiene*, p. 293.

§ That this is dependent on the extreme dryness of the air seems certain. The interior of the hut is warm but the air is all but devoid of moisture. The atmospheric dryness of the northern regions is proverbial. During winter clothes put out wet lose their moisture more rapidly than in an English sun. Such is the evaporation from the surface of the ice, that a stone originally attached beneath gradually finds its way to the top. Moisture in the solid state is abstracted from every material possessing it. The effect of this on all organic particles is palpable, they dessicate and become innocuous. In this probably lies the apparent anomaly in Spitzbergen, Iceland, and Artic Zone, of great overcrowding and vitiation with absence (or all but) of pulmonary disease of all kinds.

deficient stamina, if not minor visceral defects, especially from malaria, are universal features; but whether actual disease be present, or undermined health merely, marked deterioration is all-pervading. As a resultant, not only is the individual rendered doubly susceptible to agencies of respiratory disease (whether climatic or preventible), but the constitutional condition is furnished for that latency and metamorphosis of inflammatory products designated tyrosis—caseation, and which is a necessary link in the chain of events from inflammation to the chronic textural disorganization.*

Professor Maclean, C.B., on the subject of malaria, remarks (Army Medical Blue Book, 1870, p. 312): "Phthisis, as might be expected, ranks as our most "fatal disease. The opinion set forth by Boudin, by Nepple, by Drake, and "others, that phthisis is a rare disease in malarial climates, meets with no "support from our experience at Netley. British troops serving in the most "malarious climates of India enjoy no exemption from this disease. On the "contrary, there is much reason to believe that the depressing effects of the "malarial poison on the constitution is a powerful aid to the vitiated atmosphere "of barrack-rooms in at least predisposing to this disease. Out of 2,769 cases of "phthisis admitted since the month of March 1863, when the Royal Victoria "Hospital was opened, to the 31st December 1870, India furnished 1·169." In the tables from the Convalescent Depôt at Landour, drawn up by Staff-Surgeon Kellett, A.M.D., there also it is shown that out of 29 men admitted with phthisis no less than 27 had also ague. (Blue Book, 1871, p. 219.)

From this deterioration the civil class from which the soldier is drawn is necessarily exempt. That it is a strong differentiating feature, second only to barrack habitation, between the two segments of the community, cannot be doubted; and not only possibly, but highly probably, responsible in no small degree for the maintenance of the proportional excess of the pulmonary disease among the soldiers. It is true that the guards, with the highest ratio of consumption, are exempt from this condition of service. These, however, constitute but a small segment of the army as a whole, and offer no tangible objection to the statement advanced; it only concentrates still further the defects under which they labour as compared with the other branches.

Under this heading also must not be omitted such "alien or engrafted "phthisis" as the dysenteric form, the originating lesion being invariably contracted on foreign service. A tour of duty in India or the Mediterranean carries with it, besides general health deterioration, diseases of devitalizing influence which concur to produce that "vulnerability of constitution" above mentioned, and which seems as potent for subsequent lung disorganization as hereditary tendency, and to replace it in the military segment.

Thus, then, as a *résumé* of etiological group I, we deduce the chief direct agencies of the inflammatory group of lung destruction in the following conditions, arranged in the order of their noxious qualities:—

(1) Respiration of organically vitiated air.
(2) Climatic variations.
(3) Chest constriction, and in a minor degree—alcoholism.

To these, operating directly upon the pulmonary textures, we must supplement the main causes of general deterioration,—those producing the "vulnerable "constitution:"—

(1) Tropical service, and deteriorations therefrom resulting.
(2) Alcoholic imbibition.
(3) Night duty, and partial defects of diet.

Etiological Group II.

The influence of the syphilitic virus in the production of disease and loss to the service through the medium of the pulmonary viscera is here assumed as exemplified in 15·21 per cent. of the total amount of phthisis in the army,

* At p. 511 of the Sanitary Commission for 1859, it is deduced from the statistics that in proportion as the general health of the troops deteriorates, so the deaths from diseases of the respiratory organs (including phthisis) increase.

† Blue Book for 1861, p. 433.

either by the formation of specific pathological growths in the lung substance, or by an induced inflammatory action, vesicular or tubal in site, and the subsequent phases of the products; both ultimately terminating in textural disorganization.

What the relative prevalence of syphilis may be among soldiers, as compared with the population generally, as elucidatory of its influence upon the mass of phthisis in the army, and especially its excess, is an extremely difficult problem to solve, and merges, on the latter point, wholly into an expression of opinion. Dr. Parkes opines that "there is no reason to think that syphilis "prevails more among soldiers than among the civil male population of the "same class,"* but whether more or less, "there is an appalling loss of service "every year from the immediate or remote effects of the venereal virus;"† and Sir J. Paget answers to a question from the Commissioners, "that it would be "difficult to overestimate the amount of damage that syphilis does to the popu-"lation;"‡ hence we may infer that the enthetic poison has little to answer for in the production of the *excess* of lung disorganization in the military segment. It is, however, advanced in these pages that 15·21 per cent. of the whole is actually due to the virus, and if we look for data of the presence of constitutional infection in the army, as an efficient nidus from which might evolve these three forms of pulmonary implication, we shall find some clue in the yearly statistics! The primary lesion and the local defects, with the vast temporary inefficiency therefrom resulting, does not concern us here, but the existence of the poison in the system at large capable of producing internal structural changes, and this is partially expressed in the admissions from the secondary forms of the disease, and the ensuing loss to the service. The statistics of the years 1863-9 inclusive indicate as follows:—

		Annual ratio of admissions per 1,000 of strength from consecutive syphilis.	Annual loss from deaths and discharge per 1,090 of strength.
Home	Cavalry, Artillery, and Infantry	31·	1·51
	Foot Guards	30·4	1·19
	Household Cavalry	17·04	·11
Foreign	Gibraltar	15·3	·88
	Malta	9·1	·50
	Canada	21·5	·63
	West Indies (White Troops) ..	24·8	·17
	Cape	45·7	1·74
	India	31·06	2·20
	Black Troops, West Indies ..	28·	1·26

These figures, however, are far from expressing the actual amount of constitutional disease present, but are valuable especially as giving the relative mass in the several stations of the army, and indicating the proportion of syphilitic phthises to be met with in the sum total of lung disorganization rampant in each; they embrace merely those forms of the virus agency which are superficial in character (limited mainly to the outer surface of the body or within reach of ocular demonstration) and beyond all etiological doubts, and but few of the specific lesions of the internal viscera which find a refuge in nosology to frequently under "local disease."§ The necessary supplement are the observations derived from the *post-mortem* examination of soldiers either dying of a lesion acknowledged specific during life (extremely few of which appear in the above figures under "loss," the per centage of the mortality

* *Practical Hygiene*, p. 539.

† *Ib.*, p. 545.

‡ Quoted by Dr. Gordon, D.I.G., *Med. Chir. Review* for April 1871, p. 455.

§ Professor Parkes remarks, p. 546, *Practical Hygiene*—"that the influence of "this cause is very imperfectly indicated by the number of admissions and service "lost under the head of enthetic diseases," as "many soldiers die at Netley from "various diseases whose real affection has been syphilis."

being but a cipher), or from some other alien form of disease. Taking as a guide the necrological registry at the Royal Victoria Hospital, from 1860–71 inclusive, we find that in 46·2 per cent. of the bodies distinct specific visceral implications were present.

A perusal of these figures must render it apparent that in the army there is a vast specific fostering bed for the germination of pulmonary consumption, directly or indirectly.

Under the specific form headings in the first part of the essay, I adverted to the opinion generally current in favour of the comparative innocuous nature of nodes in the lung tissue, as well as the relative non-importance of the virus in the production of pulmonary consumption compared with other factors adduced as more efficient, although the proneness of syphilitics to succumb to phthisis (an opinion of a far back date) was allowed. On this point the Commissioners state*—"the lungs, too, are frequently affected, although the cause is probably "much overlooked, as the form of consumption which is known so often to "follow in the train of syphilis has been regarded merely as tubercular and a "result of the debilitating effects of syphilitic disease." At page 331 of this essay are the data of an analysis of 67 cases, in which the thread of connection between the systemic infection and the death cause was clearly defined; here the remarkable tendency of the pulmonary textures to deterioration, whether under the garb of inflammation or as exemplifying phthisical disorganization independent of specific growths, or through the medium of gummata, was depicted in the overwhelming percentages. The 15·21 per cent. of lung-destruction classified under this group 2, had the constant associate of specific diathesis well defined, and whatever the stand-point adopted, whether that of systemic infection and subsequent ratio of pulmonary involvement, or that of phthisis conjoined with a prior virus existence, the mutual inter-dependence cannot be gainsaid, nor is the vast influence of this enthetic disease diminished in potency by the theory advanced of its actual relation to the subsequent lung disorganization. Of the 5·65 per cent. originating in nodes, no doubt can exist, and the reasons for including the remaining 9·56 per cent. under the same category are stated under their respective pathological headings, and need not be here recapitulated.

The accumulation of facts tend to the interference that this virus has been much underrated as a factor of visceral disease; and as regards the special forms, the subject of present remark, the balance of evidence is in support of the assertion that 15·21 per cent. of the total army lung destruction is directly attributable to it, and entirely independent of all predisposition.

It follows that the existence of this group is necessary bound up with the presence of the infecting virus among the population at large, and its ratio in the sum total of phthisis to the rampancy or otherwise of syphilis—in accordance with the means taken for suppression and eradication. The table above given (p. 389) shows that the general average of poison prevalence is about equal at home and abroad, but markedly fluctuating in segments and in stations of foreign service; very prominent in diffusion and severity at the Cape and India, in a minor proportion at Malta, the centre of suppressive measures—the statistics markedly contrasting in spite of the general levelling down influence of frequent changes in the garrison constituents. The excess of the virus among the black troops in the West Indies would doubtless partially explain the high ratio of consumption among them as compared to the European troops, and the same holds good of the Foot Guards as contrasted with the Household Cavalry, fully bearing out the repeated observations of Drs. Aitken and Balfour, D.I.G., that no small proportion of the phthisis of the Foot Guards is dependent on syphilitic infection.

Granting the cogency of these previous remarks, we may infer that a certain percentage of pulmonary consumption will invariably be connected with the presence of syphilis independent of all other surrounding conditions, and originating directly in the influence of the virus on the lung textures; we may also deduce, that when not immediately exciting diseased action in these organs it may greatly assist thereto by its deteriorating agency on the constitution generally, rendering these delicate textures liable to be unduly acted upon by

* *Commission on Venereal Disease*, 1867, p. 11.

minor morbific excitants, and furnishing a status of body extremely favourable to the tyromatous phase in inflammatory products. It also follows, that in the elucidation of the prevalence of pulmonary consumption in any given community it is impossible to disregard this important factor, among others, of production. Taking as an example, the army, it would furnish but a small quotum of the Malta phthisis, or that of the Household Cavalry; on the other hand, we should expect frequent examples of it in India and the Cape, in the black troops, the home segment generally, and the Foot Guards.

In this causation of the consumptive group especially, the health of the army is intimately linked with the civil population and dependent on it, eradicatory measures among the former being but of slight benefit unless supplemented by suppressive ones applied to the latter; the ratio of prevalence among the military being a very accurate index of the specific sanitation of any given community; the army segment, in this respect, being to the civil segment as the river mass to the potency and numerical importance of the feeding springs and sources of supply; hence the great value of the preventive acts in force, and their hardly-to-be-overestimated importance in the reduction of sickness, misery, and loss, and the prevention of the transfer of disease, ill-health, and unhappiness, to the innocent and irresponsible, and the future offspring.

Etiological Group 3.

Under this are embraced those forms of pulmonary disorganization secondary to alien structural lesion elsewhere and including pure tubercular phthisis as dependent on caseous degeneration of disease products in some site other than the lungs; hence the surrounding conditions of the group are those of the derangements to which the pulmonary disorganization is in the nature of an occasional sequel, and, consequently multiple and diversified. In numerical frequency it is not important in the army, making up in the aggregate 10·77 per cent., comprising six individual varieties as previously enumerated. The frequency of these varieties, and their proportionate importance to the other groups, will, of course, be in relation to the predominance, or otherwise, of the diseases from which they originate, never a constant factor in the phthisis mass but essentially fluctuating and excepting the dysenteric form probably less frequent in the army than in the civil segment of the population. Each variety may be regarded as accidental, forming no necessary appendage to the disease with which it is associated as secondary in point of time and causation, generally connected with chronicity of the lesion, and under the dispersion of derangements to the viscera, the stress falling upon the pulmonary textures either from anatomical relations as in embolic transference, acute tuberculosis, &c., or when a general dyscrasia is existent, from the delicacy of organization of these organs as compared with the other textural components of body.

Beyond these remarks, and those included under the separate heading in the first portion—the pathology—it does not seem necessary to pursue the subject at large; the *hygienic conditions* of the group resolve themselves indirectly into those of the individual originating factors, and thus the lung disorganization, not acknowledging a direct dependence on general external agencies, but essentially bound up with individual peculiarities and varying morbid conditions operating from within the body, the detail of the surroundings would imbrace a range beyond the scope of the present inquiry.

The presence of consumption among animals, &c.

An old inquirer alluding to the advantages of comparative pathology, says:—"It will be seen that many of the domesticated animals are afflicted with tubercular diseases in all respects analogous to those of man. By taking advantage of the information which may be derived from such occurrences very important accessions may be made to the resources of our art. By having the animals much under our control we may not only be able to ascertain the causes which are most influential in generating or propagating such diseases, but we shall at the same time gain knowledge of the means by which they are most likely to be counteracted. In all the essential points of organization the identity is so great as to leave no reasonable ground for questioning the accuracy of inferences which may be drawn from diseases which may take place in the

" muscles, the membrane, the lung, or the bone of a cow or a horse, and disorgani-
" zations of a similar character which may occur in similar textures in the
" human body."* From an extensive observation Dr. Crisp deduces "that
" tubercle in wild animals (excepting rabbits in unhealthy localities) is rarely
" or never met with." He had never found it " in an invertebrate animal, but
" in fishes he had seen tumours that had some resemblance to tuberculous deposit
" in the higher vertebrata. One peculiarity in the lung tubercle of mammals
" and birds was the general absence of cavities and the large amount of earthy
" matter in many orders, especially the ruminants.† An examination of 100
" different species of animals in confinement—mammals, birds, reptiles,"—
exemplified that " all were liable to tubercular disease in the lungs, liver, spleen,
" mesenteric glands or intestine."‡ Jouatt states that " in the Zoological
" Gardens the sheep collected from various parts of the world and retained in
" captivity seldom last out the second year, they die of tuberculated lungs."

Turning to the associated conditions of life we find a series of observations all tending in the same direction—foul air. "It is well known that cows " confined in close stables in towns become tuberculous, and would die con-
" sumptive if not sold to the butchers at the commencement of the disease ;
" and that rabbits may be rendered tuberculous in a few weeks by confining
" them in a close humid place, and feeding them on innutritious food ; and
" they are as often cured by removing them to a well-aired dry situation and
" giving them nutritious food."§ " The same effect of pure and impure air on
" health and mortality is still more strikingly shown by horses. In cow houses
" and kennels similar facts are well known, disease and health are in direct
" proportion to foul and pure air."‖ The vast sheds, many of them under-
ground, in which the New York cows are kept repeat the same tale, but here not only is the overcrowding enormous but the beasts are fed on the fermented refuse material of grain after spirit distilling, it being considered a milk producer. Dupuy, a French veterinarian, noted the same as regards the Parisian cows and mentions that the disease is transmitted to the offspring. A scrutiny of the lungs of the stall-fed oxen, and especially sheep, slaughtered for the meat market will show how prevalent are cheesy nodules in the viscus parenchyma ; these animals for the rapid onlaying of fat are kept warm, all but immoveable as to space, and in the dark breathing a foul moist tepid air with a minimum of body excretions and pulmonary function ; their flesh is rendered tender (disposed to molecular disintegration) and the lungs tubercular. In an essay by Mr. Graves, M.R.C.S.V.,¶ the subject of lung diseases in animals is adverted to, and six isolated examples of the foul air in stables producing rapid vomicæ in the pulmonary tissues ; "attacking young and old " horses, fresh and well seasoned," and constantly recurring in those replacing the former victims of overcrowding ; " free ventilation and warm dry air from " stoves stopped the disease." The injurious results of bad ventilation and dampness of stables are too well known in the cavalry of all armies to need recapitulation, equally also the innocuous and health-giving qualities of fresh air, even of cold, hitherto guarded against so carefully and so disastrously ; the effect on the lung textures is alike whether the sufferer be man or a warm blooded animal. Attention to these details has been followed by the most marked advantage to the animals of the Zoological Gardens, and not only in the diminished tendency to lung disease, but as stated by Mr. Darwin,**—" The " carnivora were formerly much less freely exposed to the air and cold than at " present, and the change of treatment has greatly increased their fertility."

The postulate may be assured, that animals are rarely, if ever, tubercular in their state of nature, and that in proportion as they are brought under domestication, in proportion as they are assimilated to human aggregation in towns and houses, so do they exemplify textural disorganization in the lungs.

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* Baron, *Inquiry into Tubercular Diseases* (Introduction), p. 29 and p. 1.
† *Path. Soc. Trans.*, vol. xvi. p. 280.
‡ *Ib.*, vol. xix., p. 472.
§ Clark, *Pulmonary Consumption*, p. 229.
‖ *Practical Hygiene*, p. 85.
¶ *The Veterinarian*, Jan. 1872.
** *Animals and Plants under Domestication*, vol. ii. p. 151.

Of the nature of the induced lesion in animals the general expression of those who have inquired into the matter is in favour of an identity with man; advocated strongly by Davy. All diseases may be centred in the pulmonary organs (Reynaud), or associated derangements in other organs and textures may be in sequence (Crisp), or general tuberculosis in which a very prominent position is assumed by the lung implication may originate from a caseous focus of infection—examples of which are given by Dupuy. An example of the disease is brought forward by Dr. Babington, in the *Pathological Transactions*, vol. vii., the subject, a pony, lungs the only organs affected; "tubercles, from the size of a grain of shot to a pea clearly showed the "pulmonary cells to be the seat of the deposit;" under the microscope were observed "abortive cells, earthy, fatty, and granular particles with the ele-"ments of pulmonary tissue." I may supplement these observations by the following illustrations coming under my personal cognizance. A monkey exemplifying catarrhal consumption; a dog with lobular pneumonic form; a giraffe with the lesion ensuing on hydatids. Preparations, R. 667, W. 619, and R. 678, W. 621, at Netley, exemplify the latter form in the sheep; and R. 619, W. 563 also illustrates pneumonic phthisis in the mecacus rhesus.

In addition to these examples of lung destruction among animals are the induced lesions by inoculations of diseased and degenerate products, and the summary of the results by Dr. Sanderson, already detailed at page 346; the pulmonary lesion, either originating as a pneumonic form, or through the development of miliary growths. These instances appear to me clearly to warrant the deduction that among the lower animals there are forms of consumption to be met with, not to be differentiated from varieties of lung destruction observed in man. Hence it is not here a question of liability or non-liability on the part of the lower animals to succumb to textural disorganizations of the pulmonary viscera equally with the bimana species, but the inferences to be drawn from the disease as seen among them on the point of causation, and the application of such as a basis of preventive measures generally adaptable. Whatever may be the degree of superior intelligence, the differentiating mental, moral, and spiritual endowments of man as compared with the lower animals, yet, as observed by Bacon, "certainly he is of kin to "the beasts by his body," the organs for the support of his frame made on the same type with them for existence under the same natural surroundings.* Considering the general concordance in arrangement, function, and structure, of the respiratory system throughout the mammalian class,—that many of the component species exemplifying lung diseases mutually similar in the different animal forms, it seems only rational to conclude, when examples of such lesions are met with, that similar processes of production have been in operation; and, as regards man, that his lungs, performing the same functions as the quadrupeds under like external conditions, degenerate and become disorganized, like theirs, under the same unhealthy circumstances of life, though probably in a greater numerical ratio in accordance with the degree of textural delicacy. The varieties of lung destruction, common to man and mammals, are,—the catarrhal, sub-acute pneumonic, pure tubercular, and a local form due to hydatid irritation, each originating under its own especial conditions, and the inference is, that deductions from any one species of animal upon the causation, nature of the process terminating in disorganization, the devising of preventive measures, are mutually trustworthy and generally applicable.

The conditions under which the disease originates in animals are those imposed on them by man, and the ascertained facts tend to substantiate the deductions arrived at from inquiry into the etiology of the human varieties of lung-destruction—their enormous dependence on external causes of a preventible nature. The presence of these lesions among animals, removed from their normal sphere of life to the conditions of domestication, tends to cor-

* "And the Lord God formed man of the dust of the ground." Gen. ii. v. 7. "And out of the ground the Lord God formed every beast of the field and every "fowl of the air."—V. 19. Also chap. 8, v. 19. "For that which befalleth the "sons of men befalleth beasts; even one thing befalleth beasts. As the one dieth, "so dieth the other; yea, they have all one breath; so that a man hath no pre-"eminence above a beast."—Ecclesiastes iii. v. 19.

roborate also the opinion on the non-essential nature of inherent diathesis and hereditary predisposition for their origin and development in man. The intention here is not to underrate or deny the existence of the so-called tubercular or strumous diathesis and its potency as a nidus of lung-disease germination, but to assert the more important influence of external surrounding conditions as factors of consumption, and especially of those forms peculiarly dominant in the military segment of the community. Inherent tendency alone appears incapable of originating the disease, but external deteriorating agencies can; the combination of these factors is very deleterious, but any debilitated state of body ("vulnerable constitution"), no matter how induced, is as equally influential (if not more so), in the light of a predisposing cause, as inherited diathesis. The more the subject is elucidated, the more clear becomes the indication that we may minimumize in importance "constitutional diathesis" in the origin of lung-destruction in the army, and probably also in civil life, provided we get rid of external conditions of causation, and that these latter can and do, unaided, generate consumption. Granting this, we must agree that "men are rarely "born to die consumptive," and the great mass of phthisis becomes transferred to the list of preventible diseases and an important problem of sanitary science.

Summary.

In the foregoing pages of this second part of this essay it has been endeavoured to ascertain the associated conditions of the military pulmonary consumption, and to educe the main agents in its production. After eliminating from the general mass of disease those varieties dependent on prior alien diseased states of the frame and the syphilitic virus, a large bulk, comprising Group I., remained, which, from its statistical distribution and other concomitants, was considered to be intimately connected with the immediate surroundings of the soldier, and of these conditions the only one capable of explaining the excessive prevalence of the main components of the group was the amassing of numerous individuals on too limited a surface area and the respiration of air vitiated by body-exhalations. The influence of climate, directly or indirectly, has also been considered; and the resultants of this second portion of the inquiry may be tabulated by an arrangement of the agencies in operation in the production of the sum total of military disease, in destructive intensity, as under:—

(*a.*) Air vitiated by respiratory and cutaneous exhalations.
(*b.*) Climatic variations.
(*c.*) Syphilitic virus.
(*d.*) Chest constriction.
(*e.*) Alcoholic imbibitions, and deteriorations therefrom.
(*f.*) Tropical service and deteriorations.
(*g.*) Other diseased states.
(*h.*) Deficiency of certain food constituents.

Of these *a*, *b*, and *d* have a direct influence on the pulmonary textures; *c* and *e* indirectly through the system at large by infection; the remainder act mainly by their devitalizing effect on the frame generally, and furnishing the status of body requisite for the pathological chain of events. The tabulation of the groups and varieties under their respective causes is early detailed. It has been shown that the nature of the main mass of disease is inflammatory, and it has been endeavoured to point out how such an agency as foul air, by its effects on the delicate textures of the lung, both excites the proliferation of the alveolar cell elements leading to consolidation, and, by its molecular deteriorations of the normal tissues, favours the latency and caseation of inflammatory products, however generated. The influence also of such general deteriorating agencies as tropical service and its diseases, alcohol, venereal diseases of all kinds, in furnishing the "vulnerable constitution," has been brought forward; for, as remarked by Dr. C. J. B. Williams, "inflammation alone does not "suffice to produce phthisical disease of the lungs. Acute inflammation may "attack the lung in any intensity, and yet pass without leaving any trace or "tendency to consumption. It is where it is rendered persistent or chronic by "repeated attacks or neglect, or where there is a state of constitution called "scrofulous, or deteriorated by unhealthy influences which degrade nutrition, "that the products of inflammation tend to caseation and excavation and end in

"consumption."* There can be no question of the prevalence of such conditions in army life; and it has been the purport of this essay, while elucidating the nature of the varieties, to show how the several agencies in operation either *per se* both induce that proliferation of the textural elements classed under inflammation and conduce to latency of product, or by their general influence produce a constitutional infirmity no less leading up to the same end when the ordinary excitants (climatic variations or otherwise) of tubal or vesicular lesions of the lung are in operation.

The barrack habitation is held responsible directly for 26·52 per cent. of the total mass of disease—the sub-acute pneumonic, in no small degree for the hæmorragic form, and indirectly assisting in the production of the catarrhal variety. Hence upon this main stratum of disease thus generated—generally diffused in the service and universally conspicuous—must be reposed the minor strata of acute pneumonic and catarrhal, of climatic origin; hæmorrhagic, due to chest constriction; the syphilitic, tubercular and alien phthises; in the construction of the aggregate mass of consumption present in any given segment or station of the military community; for it is apparent that in so compound an item as phthisis it is only by a breaking up of the sum total into the individual elements, and transference of each to the proper causation heading, that we can thoroughly understand the agencies in operation and devise appropriate preventive measures: all else must be mere conjecture.

We may assert that the army pulmonary consumption is due to the conditions presented by military service, supplemented by climate and personal defects, moral and physical.

The one common factor, foul air,† is general though fluctuating in degree, but as we have seen the other conditions vary—the accoutrements, clothing, &c., according to the branch of service in which the soldier enlists, he serves in all climates, individual peculiarities and circumstances within personal control are fluctuating features, but all these allow a range in causation which it is necessary to gauge in any inquiry into the bulk of disease present in any given section. The cavalry have an advantage in the absence of pack and decreased chest constriction, less night work, better barrack accommodation,‡ and give the lowest ratio in the branch consumption of the army; the infantry predominate in defects and disease; the artillery are intermediate in both respects. The Guards generally quartered in the metropolis, the Dockyard and Arsenal Depôts, and the West Indian Black Troops head the list both in consumption and respiratory diseases. The Guards are located in dense unsanitary neighbourhoods,§ overcrowded in barracks with no proportionate excess of space allowed for their large bodies, and consequent excess of excreta given off; many are married, with wives not borne on the strength of the corps;‖ the foot division preponderates in consumption in the ratio of 13·10 to 10·04; syphilis is greatly in excess among them as compared to the household cavalry,¶ and the ordi-

* Remarks at the Medical Society detailed in *Medical Times and Gazette*, January 10, 1871.

† As showing the influence of barrack air on consumption are the facts observed on those occasions in which removal for some time has allowed appreciable results, *e.g.*, "Statistics of the Army before Sebastopol," quoted by the Sanitary Commission for 1859; the Guards in Canada in 1838 on active service, when "they were healthier "than any other branch of the service in the proportion of 14 to 16;" the "Reports of the Crimean Pathological Board;" "Contrast of the Sepoys with the white "troops in India;" the disease visits with less severity the soldier on the march."

‡ The Sanitary Commission for 1859 also observes that they are in general less crowded in barracks than the Infantry, and have more out-door occupation.

§ As late as March 30, 1872, was a letter in the *Lancet* complaining of this fact, and especially mentioning the foul sanitary surroundings of the Knightsbridge Barrack.

‖ "Marriage with or without leave, but without the advantages of being on the "strength of the Corps is very common in the Guards, and that it is a fruitful source "of general deterioration few will doubt. It means bad nourishment and the "occupation of some small room, or part of a room, in a foul, overcrowded locality "when duties do not detain the individual within barracks."

¶ Drs. Aitken and Balfour consider the phthisis of the Foot Guards to be intimately connected with syphilis; the figures previously given show the excess of the virus among them as compared to the Cavalry, and the proportionate excess of marriage among them would indicate an excess of syphilis among the unmarried as contrasted with the Infantry generally in the home districts.

nary disadvantages of infantry are superadded as exponents of the higher phthisical ratio. In the Dockyard and Arsenal Depôts is to be found an overcrowding above the average of the stations in the United Kingdom occupied by the Infantry Regiments. Contrasting the West Indian Black Troops with the white soldiers, we shall find the defects to explain the preponderance of diseased lungs among them as follows—extracted from the yearly Blue Books :—

(*a.*) Quartered in the worst barracks, with overcrowding and defective ventilation.

(*b.*) Excess of syphilis and sexual indulgence.

(*c.*) Major night duties.

(*d.*) Inadaptibility of Zouave dress to the climate, hence frequent colds, coughs, &c.

(*e.*) Deficient constitutional stamina and inherent susceptibility to the agencies of lung disease and the syphilitic virus.

The excess of respiratory disease, especially tubal, in the temperate zones of the earth from climatic variations, the prominence of acute lobar pneumonia in the sub-arctic, the existence of sub-acute vesicular disease and respiratory disease in general to a greater degree in towns over country districts, independent of climate, the minimum of syphilis, both primary and constitutional, in Malta, the preponderance of this enthetic virus at the Cape and in India; these again form modifying elements in the amount and varieties of consumption present in the stations of the British Army. Hence in the United Kingdom the dominant varieties would be—catarrhal, sub-acute pneumonic, and syphilitic ; in North America, sub-acute and acute lobar pneumonic ; in the Mediterranean, sub-acute pneumonic ; at the Cape, Ceylon, and India, syphilitic and sub-acute pneumonic ; at Australia and New Zealand, corresponding to the home stations ; the forms of lung destruction, in accordance with the several existent agencies of the prodrome, and prominently in ratio to the degree of attention paid to barrack accommodation and the requirements of sanitation, and the means taken for the suppression of enthetic disease. As an example of these points above referred to, I may give the details of a foreign and home service tour of a regiment, in sequence as follows :—

(1.) Malta, 4 years, average yearly cases of phthisis, 1·04 per cent. of strength, mainly sub-acute pneumonic variety ;

(2.) New Brunswick, 3 years, average yearly fresh cases, 0·26 per cent. of strength, mainly acute pneumonic ;

(3.) Home service, 2 years, average yearly cases, 0·92 per cent. of strength, disease chiefly catarrhal ; a remarkable comparative freedom from constitutional syphilis depicting the whole period of 9 consecutive years.

It will be observed that the major part of the phthisis is presumed to be preventible, a minor part connected with atmospheric variability and practically not entirely to be guarded against ; a still more diminutive quantity rests upon the prevalence or otherwise of various diseased states, and is essentially fluctuant.

Taking as a basis the foregoing details the suggestions for curtailing the disease* range themselves under the following headings :—

(*a.*) Improved barrack accommodation, comprising proper diffusion over the surface area, limitation of numbers in one compartment, sufficient initial respiratory space and means of requisite renewal without draughts ;

(*b.*) Prevention of syphilitic infection ;

* Irrespective of the vast decrease of phthisis and respiratory diseases in the army during the last 12 years, as compared with the former periods of rampancy of sanitary defects, an example of what may be done is given by the *Med. Chir. Review*, April 1859, p. 432. "In the Duke of York's School, at Chelsea, an epitome of "barrack life, by getting rid of overcrowding, by ventilation, and by improvement of "the diet, Dr. Balfour reduced the mortality from 9·7 to 4·8, and the proportion "annually reported unfit for military service from 12·4 to 4·6 per 1,000 in an "average of 8½ years."

(*c.*) Freedom of respiratory act under exertion, and adaptability of clothing and accoutrements to this end, and the former to climatic requirements;

(*d.*) Suppression of inebriety, especially the drinking of raw spirits;

(*e.*) Careful selection of the men by recruiting with a view to the correlation of the height and breadth with age, good vital chest capacity tested by spirometer, and exclusion of all predisposing conditions detectable in the body; retainment and improvement of these qualities to a higher standard of physical strength and development by gymnastic exercises.

I am aware that in these suggestions there is but little of novelty, that they have been repeated and re-echoed by independent observers; the authorities have brought out partial measures for their enforcement, yet far short of the requirements. Meanwhile, the latest statistics (1870) give an amount of admissions, discharges, and mortality from consumption in the service, generally exemplified in 10·3, 5·1, 2·3 per 1,000 of strength respectively, or in other words, 1,589 admissions and 1,128 loss in the British army in one year from destructive lung disease. Surely in these facts are sufficient grounds for the renewal of the proposition that pure air is as essential as food, and that the soldier in giving up his liberty to the State is entitled to both, and that in no parsimonious spirit, and certainly not within and short of the requirements of the case!

On the point of housing, the several Barrack and Sanitary Commissions have spoken with no subdued voice.* There is no doubt apparent in their conclusions and suggestions as to what is necessary, neglect of them, or tardiness in bringing them into operation are the dominant features discernible, only too patent to observation, and too baneful in results even after an interval of twelve years. When the general idea on the connection between the prevalence of sickness and dispensations of Providence is overthrown, savouring of mysticism and blind unquestioning superstition, and when mankind is educated up to see within himself, his surroundings, his social and political life, the germs of the enormous wretchedness, sickness, and unnatural mortality which pervade all classes and states in life, then we may look forward to the erasure of these large disfiguring blots from the records of humanity, and to the lengthening out of man's days to the allotted period of three score and ten untrammelled by sickness, suffering and sorrow. The laws of sanitary science are clear, and their practical application are within our reach, inability to appreciate their bearings and the necessity for them, seems the deterrent force, and it is essential to educate the mass up to the required standard of ability to comprehend, otherwise laws made for observance savour of oppression, being misunderstood, and tend to opposition.

In concluding this succeeding portion of the subject, and with it the essay, I fear that it may be asserted with truth that this latter half contains but little of novelty, and that it partakes rather of the nature of a *réchauffée* of opinions expressed by worthier pens. To this I subscribe, with the retainder that the conclusions arrived at are the result of independent and unbiassed working, that the treading so markedly in the footsteps of others is a necessity when deductions coincide, and that giving one more expression of adhesion to a proposition already advanced is the addition of a stone, however small, to the gathering pile which may assist in augmenting its influence. The accumulation of facts tends to strength, and it is by a combination of individual opinions, all culminating in the same conclusions, that the necessary pressure may be brought to bear for the obtaining of the soldier the requisite surroundings of health. Heretofore he has been regarded much in the light of a social scum for whom any housing was sufficiently good, but now the difficulties of obtaining good recruits are acknowledged even with a reduced standard of physical qualities, and the money value of the labours of an individual has augmented, hence, commercially speaking, he is worth taking care of. In

* The Sanitary Commission, 1859, recommended 600 cubic feet as a minimum in barracks, 3 feet between each bed, no urine tubs in rooms, a day room, thorough ventilation; even in 1872, what proportion of barracks in the United Kingdom exemplify these essential points, or even one of them?

spite of the general tendency to underrate this class of the community during peace as "black sheep," those who have the most intimate knowledge of the soldier know him to be at least the equal of his social compeers in all respects, while exposed to many more temptations. He has given up his liberty to the State, and bears temporary ostracism from his country, the hardships of a campaign, and loss of life, without murmur, so long as it is for his country's good. It is not too much to require, as mere justice, that those who remain at home in ease and domestic comfort, with the priceless boon of peace and quietness to pursue their remunerative avocations, should willingly and cheerfully burthen themselves with a small pecuniary mulcting for the sanitary housing of their defenders. It is unquestionable that much remains to be done for the physical and moral welfare of the married and unmarried soldier equally, and it is no less certain that upon the State at large the duty falls.

It may be unhesitatingly stated as an axiom, that a certain yearly percentage of deaths, to say nothing of the precursory sickness, suffering, and misery, occur in the service solely from the conditions under which the soldier is placed by the State, through pulmonary consumption; that these conditions can be shown, upon evidence as clear as that which directs the enforcement of the law, to be within control and removeable: the corollary of this is apparent, and needs no expression.

It is quite clear that the medical mind is far from stability upon the nature of destructive lung disease. The past history of the subject illustrates a swaying backwards and forwards of the pendulum of opinion no less conspicuous in the present day, which, unless we allow a certain substantive basis of facts and accurate deductions in each opposing theory, augurs badly for the early elucidation of truth. The cry of each searcher into the obscure realms of life and disease is still an echo of the wise men of old—"*light! more light!*" for we are far from having dispelled the mists which shut from our mental vision the perceptions of the nature of pulmonary consumption. Fortunately, however, the search into the life history of the malady has revealed some of the associated surrounding conditions necessary for its development, and hygiene, taking advantage of these facts, has raised a basis of precaution full of future hope. No less applicable to the special subject are the remarks on disease in general by the great teacher of modern sanitation. "In the scheme of Provi-
" dence it may not be meant that man shall be healthy. Diseases of mind and
" of body may be the cross he has to bear, or it may be the evil against which
" he has to struggle, and whose shackles he is finally to unlose. The last
" disease will disappear, we may believe, only when man is perfect; and as in
" the presence of the Saviour all disease was healed, so, before perfect virtue,
" sorrow and suffering shall fade away. Whether the world is ever to see
" such a consummation, no man can say; but as ages roll on, hope does in
" some measure grow. In the midst of all our weaknesses, and all our many
" errors, we are certainly gaining knowledge, and that knowledge tells us in no
" doubtful terms that the fate of man is in his own hands.

"It is undoubtedly true that we can, even now, literally choose between
" health or disease; not, perhaps, always individually, for the sins of our
" fathers may be visited on us, or the customs of our life and the claims of our
" civilization and social customs may gall us, or even our fellowmen may deny
" us health, or the knowledge which leads to health. But, as a rule, man
" holds his own destiny, and can choose between good and evil; and as time
" unrolls the scheme of the world, it is not too much to hope that the choice
" will be for good."*

Should this essay assist in the elucidation of the multiple forms of destructive lung disease classed under consumption; should it help in rivetting attention to the great mass of preventible sickness and suffering existent in the community at large, and especially in the military segment of the population, and so tend to extend the measures of prevention; should it assist in demonstrating that ignorance and disregard of the laws of health have their resultants in disease as cause to effect: and that man, not Providence, is in fault in the "ills from which we suffer," and "to which we are heirs," then one main object for which it was written is attained, and the labour well recompensed.

* *Practical Hygiene* (Introduction), p. 21.

APPENDIX No. VI.

AN ESSAY ON THE NATURE AND VARIATION OF DESTRUCTIVE LUNG DISEASE INCLUDED UNDER THE HEAD OF "PULMONARY CONSUMPTION," AS SEEN AMONG SOLDIERS, AND THE HYGIENIC CONDITIONS UNDER WHICH THEY OCCUR.

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ON the nature of pulmonary consumption there ever has been, and still remains, a variety of theories, all of which have been prevented from resting on a fixed, or central, basis by the argumentative deductions which have from time immemorial hung round the word inflammation.

From the accidental origin assigned by Laennec, and the equally certain inflammatory source attributed in opposition by Broussais, through the various phases of compromise and accommodation, down to the most recent opinion of Dr. Williams, that the lesions constituting pulmonary consumption "originate in some form of inflammation, or in a perverted nutrition of the textures of the lungs," uncertainty and vagueness of expression prevailed until Drs. Sanderson and Fox built up consumption from without, and showed the all-important factor that exists between it and inflammation.

Insomuch as inflammation means the irritation of the ultimate nerves which control the calibre of the capillary, the consequent brief contraction, and subsequent prolonged dilatation of that capillary, the necessary stasis of its contents, and the resulting multiplication of germinal atoms in its vicinity inflammation doubtless is present at the birth of tubercle, but all this could not bring forth tubercle without the co-operation of a septic condition of the blood.

Dr. Williams says—page 12—"Thus, in a previously healthy subject, consumptive disease can arise only from inflammation of a low type, or rendered chronic by inefficient treatment." Now the use of such terms, even from the pen of so great an authority tends to perpetuate confusion.

There never could be such a thing as a low type of inflammation in a typically healthy body, nor any form of inflammation except that which would result from the direct action of external irritants, whether they be cold, heat, or mechanical agents.

The varieties of inflammation are not, therefore, modifications of the original process, *per se*, but are indices of the deviations from the standard of perfect health, and their characteristics are in every instance a consequence of a pre-existing something in the systems in which they occur, that something, though invisible, impalpable, and incapable of being fixed even by words, is doubtless the connecting link between inflammation and tubercle.

Whether called "perverted nutrition," scrofulous diathesis, or any other of the innumerable terms by which it has been denoted, it is still by all of them admitted to be antecedent to the inflammation to which tubercle has been assigned.

So long, then, as pathology confined itself to the investigation of the decayed elements of the morbid mass it has missed the source of the disease, but now that experiment has produced tubercle by a vital synthesis, and microscopic anatomy has vouched for the existence in the lungs of the same tissue as that in which a like morbid product has long been recognised in other organs, a ray of light has come to guide research in the true direction.

The results of inoculation, as practised by Drs. Fox and Sanderson, and so

ably epitomised by Dr. Williams, prove that while tubercle can be artificially developed, yet that it is not due to any specific virus, but to the poisonous action of septic matter upon the leucocyte constituents of the lymphatic elements.

The morbid multiplication of short-lived white cells in the infected glands brings about a condition which is microscopically identical with the state of the same organs when idiopathically enlarged in a scrofulous subject.

Throughout the entire substance of the lungs minute masses of adenoid tissue have been demonstrated surrounding the finest capillaries, and in contact with the ultimate divisions of the bronchi.

If, then, the subcutaneous introduction of the pus of pyæmia, foul pus, putrid muscle, and such septic matters, is found not only to occasion, in all cases, excessive proliferation of devitalised germinal matter in the neighbouring glands, but, in the majority, also, to give rise to a like change in the adenoid tissue of the lungs producing tubercle, the cause and effect seem established, and leave the only questions now to be, in how many different ways, and from what various sources, may not the infecting matter spring from within and from without?

And may not the varieties of pulmonary consumption be but the same disease acknowledging the diverse methods by which the septic influence comes into force?

Should it be possible, likewise, to explain the characteristics of each subdivision of the disease by the mode in which the poisonous infectant was originated, and the means by which it came in contact with the adenoid tissue of the lung, it may, although assisting little towards a cure, yet lend material aid towards prevention.

The only classification of the different forms of consumption possible is into those that arise from infection which, however generated, comes through the system to the lungs, and those that are the result of local infection in the lungs; yet these are again so intimately dovetailed by the reactions between the system and the poison as to be scarcely isolable.

To the former would belong acute miliary tubercle, scrofulous pneumonia, and to some extent chronic localised tubercle; to the latter all those cases following the decomposition of pneumonic and other exudations, the attempt to absorb which had been abortive.

Of all kinds of pulmonary consumption, that which most resembles the result of inoculation (acute miliary tubercle), and of which Dr. Williams says, "these are the cases that are so precisely imitated by the experiments of "artificial tuberculisation that we can hardly avoid the conclusion that the "process is similar in the two cases," is nevertheless the only one in which the source of the infection cannot be approximately gathered.

There is, however, one curious fact connected with it, viz., that it may occur in men who, up to a few weeks before it prostrates them, have been not only apparently healthy, but pre-eminently athletic, and, stranger still, that the same holds good of the dog species.

Private S——y, —th Regiment, 25 years of age, and in his third year of service, was remarkable up to the time of his admission into hospital for his extraordinary strength.

In the feats which he could perform with a 56 lb. weight in each hand he excelled all his companions.

When received into hospital for what, apparently, was an ordinary catarrh with hoarseness, his muscular appearance and powerful frame lulled all suspicion of organic malady.

Throughout the month of February 1868, he was treated for bronchitis with congested larnyx. and it was even supposed that he was making more of the attack than its extent would warrant. At the commencement of the second month the condition of the left pulmonary apex became suspicious. At the conclusion of the third month he was dead.

The post-mortem showed extensive tubercular ulceratiou of the trachea from the epiglottis to the bifurcation, a large abscess in the apex of the left lung, and the upper lobes of both almost solid from the deposition of tubercle throughout their substance.

There is a not uninteresting analogy between this case and that of the

celebrated greyhound "Master M'Grath," who died when but a short time out of training after his last coursing victories.

Professor Haughton, in his certificate of post-mortem examination, says: "Both lungs, especially the left, were occupied extensively with tubercular "deposits, and pneumonia existed in both."

In either instance an exalted physical power had been acquired, and apparently maintained up to a comparatively brief period preceding death, and both are alike without any explanatory conditions, hereditary or acquired, which can point to a solution, except the theory of infection he embraced. Be the explanation what it may, something more than inflammation is needed, and experiment tells that *that something* is a septic.

Of scrofulous consumption Dr. Williams says: "In scrofulous constitu- "tions, whether hereditary or acquired, these results might follow any form of "inflammation." The inflammation, therefore, is secondary to the diathesis, and is but a collective designation for the several steps by which the calibres of a certain number of capillaries become so altered, and the current of their contents so slackened as to admit of the transudation of degraded germinal atoms into such localities that it devolves on the adenoid tissue of the part to effect their removal, in which effort this tissue becomes itself locally infected, being subjected in consequence, as in the case of glands leading from the site of artificial inoculation, to excessive prolification of its cell elements, with inevitable strangulation, degeneration, and death.

Thus, a pulmonary congestion, or inflammation, which, in a healthy system, would terminate in reabsorption, or the wholesome organisation of the effused products, leaves behind it, in a strumous constitution, such degraded elements that the absorbing tissue, in the contact necessary for an attempt at their dispersion, suffers inoculation, and undergoes the hypertrophy which results from such an accident.

Whether the essence of scrofulous diathesis be a morbid entity, or merely a reduction in the vitality of the whole germinal elements of the body, it will be shown in a subsequent part of this essay, that a constitutional state capable of producing like lung-results is brought about in a very large percentage of soldiers by the prolonged action of Indian heat, more particularly when aided by the subtle influence of malaria. And notice will at the same time be taken of the striking harmony of susceptibility which exists between the spleen and lungs, both in the case of experimental inoculation and climatic poisoning.

Of that third form of consumption which is usually chronic in its course, which selects for the most part the apices of the lungs as its site, and which usually seems to succeed a catarrh, being regarded in its early stages as a localised bronchitis, the most interesting question is, Why should the antecedent bronchitis, when subsiding from other parts of the lung, hang lingeringly about the apex until eventually a nucleus of a worse disease becomes established?

Having defined the reasons for the repetition and persistence of bronchitis in this locality, it will be easy to explain how the resulting exudations—although being at first but little below the healthy standard—should in time become so degenerated by the conditions in which they are placed as ultimately to be an infectant to the adenoid tissue that it touches, and to set up cell-proliferation in that structure which finally constitutes tubercle.

Dr. Burdon Sanderson, in his beautiful researches into the nature of leucocytes, which in their dead state had long been known as the white blood-cells, has shown that they are amœboid atoms of germinal matter endowed with the power of insinuating themselves through the interstices of membranes with which they come in contact, as proved by their permeation of a swimming bladder introduced beneath the skin of a guinea-pig.

And that this capability of escaping through the walls of vessels is greatly assisted by stasis of the blood within, also that the red globules of a diluted drop of blood, when subjected to the influence of carbonic acid, from being oval discs, become more or less spheroidal, so that their nuclei, which were before indistinguishable, come prominently into view as granulous looking objects.

If dilution be increased, and the action of the gas prolonged, precipitation becomes much more complete, but is quickly removed on the substitution of

common air. The precipitate thrown down by carbonic acid is re-dissolved by oxygen.

Sooner or later, however, a point is reached at which the precipitate becomes permanent.

Therefore, of these two most important constituents of the blood—the leucocytes and the red globules—the latter are disintegrated by carbonic acid, and the former tend to transude when stasis is produced.

A review of the particulars in which the apices differ from the other portions of the pulmonary organs will display a combination of circumstances largely favouring both these occurrences.

"The cells situated nearest the centre of the lung are smaller, and their "networks of capillaries are closer *than those nearer to the circumference*, in "adaptation to the more ready supply of fresh air to the central *than the peri-* "*pheral portion of the lungs.*"—*Kirke's Physiology*, 165.

In the upper part of the chest, by reason of the comparative fixity of the ribs, of the protrusion of the lung towards the neck, and of the tendency of heated air to ascend, the residual air must be less changed than in any other, and only effectually renewed during exercise, when the whole breathing apparatus is called into play. Hither, too, the blood is sent at a disadvantage, being propelled against gravity with but little assistance from the expansive movements of the thorax, and here it meets an atmosphere more charged than elsewhere with carbonic acid, organic matter, and other excreta, all of which tend to slow its current, and produce stagnation. Here, then, where the air cells are largest, the capillaries in the widest meshes, and therefore longest—the air most loaded with carbonic acid and other impurities—and where the physical and vital conditions most obstruct the progress of the blood, is the site in which, after the changes produced by inflammation, the minute blood-vessels find it most difficult to regain their normal tone and calibre.

Such are the causes owing to which, in systems already prone to delicacy, localized bronchitis hovers about the summits of the lungs, when, on the cessation of the original irritant, the other portions have, by their vital resiliency, resumed their healthy state.

Out of the globules disintegrated by carbonic acid—the transuded and devitalised leucocytes—and the occluded capillaries, a nidus of dead material is established, upon which the impure gases in the vicinity effect such changes as to render it a focus of inoculation to the adenoid tissue of the part.

In the last form of consumptive disease, or that following the decomposition o pneumonic exudations, the attempt to absorb which had been abortive, sufficient account has not been taken of the access which the external air may have to the dead product, and that much of the decomposing element, which Professor Lyster finds it so difficult to exclude from the pus on the surface of a healthy sore, even by the intervention of many folds of antiseptic gauze, must be drawn into the lungs at each inspiration. Yet it is equally true that, in many instances, the most degenerated part of an old solidification is in its centre, to which the air cannot apparently penetrate. That alteration in the condition of the effused matter may lead to consumptive destruction of distant parts of the lungs is well exemplified by the following case.

Private V——s, —th Regiment, 38 years of age, and 18 years' service, returned in particularly good health from a 14 years' residence in India, but was attacked on landing, in February 1868, with measles, immediately followed by severe double pneumonia; he recovered to a certain extent, being able to perform the duty of marching the sick to hospital, and to discharge the functions of an orderly, as well as of completing the required course of rifle practice, and becoming a marksman. The base of the left lung, however, continued solid. Eighteen months later tubercle was found to have formed in the apices of both lungs, and in May 1871 he died.

The post-mortem records that "the upper lobes of both lungs were solid "from tubercular infiltration; a large abscess in either apex; base of left con- "tained a portion of carnified tissue, a remnant of previous pneumonia, in the "centre of which were scattered nodules of cheesy material, otherwise the base "was healthy; right base quite free from any remaining induration, or fresh "deposit."

PRIVATE. S_____T.

February 1869

FAHRENHEIT'S SCALE

100°
99°
98°
97°
96°

PRIVATE. C_____N.

June 1870 July 1870.

25 26 27 28 29 30 1 2 3 4 12 13 14 15 16 17 19 20 21 22

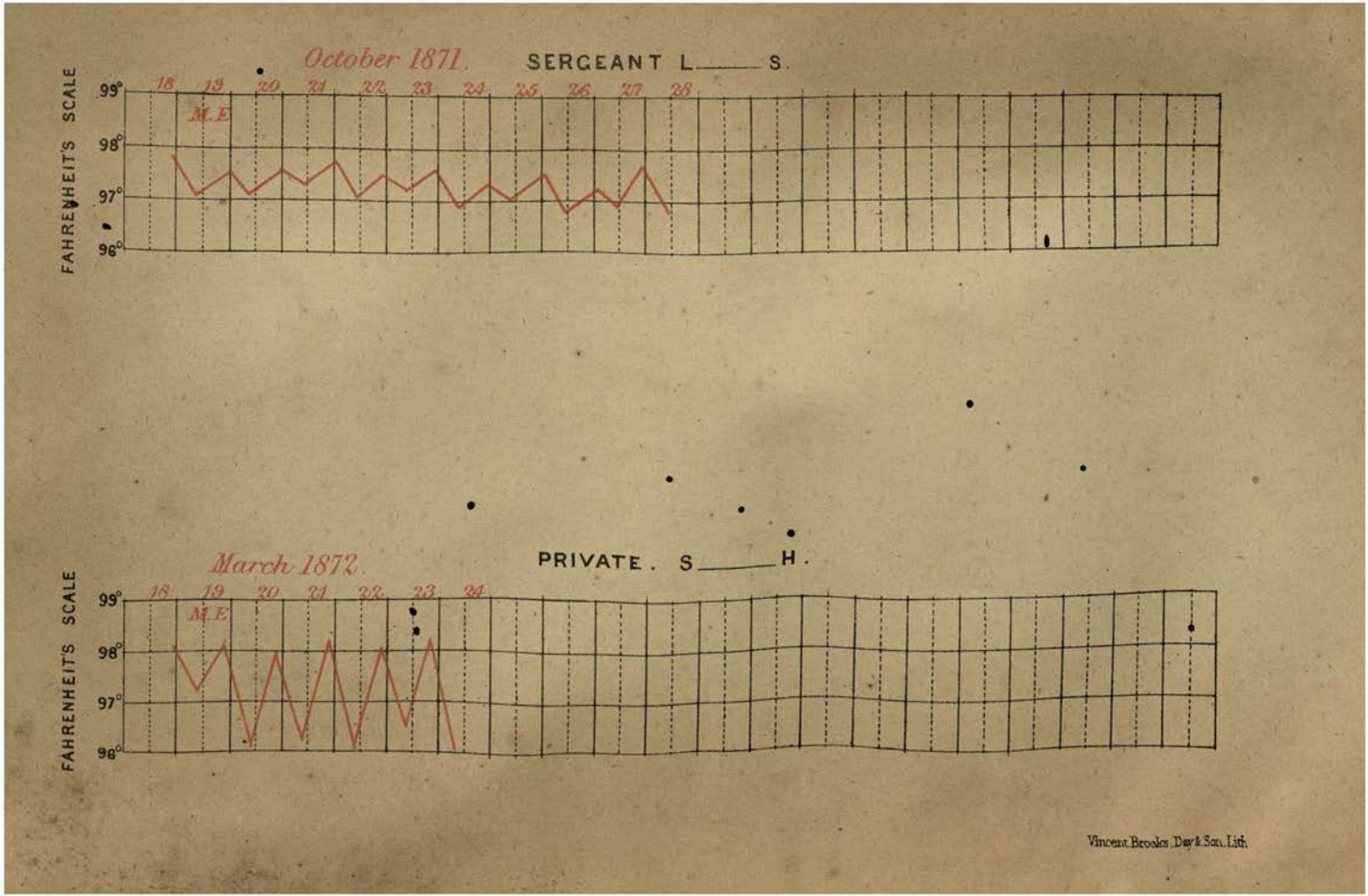
M.E

FAHRENHEIT'S SCALE

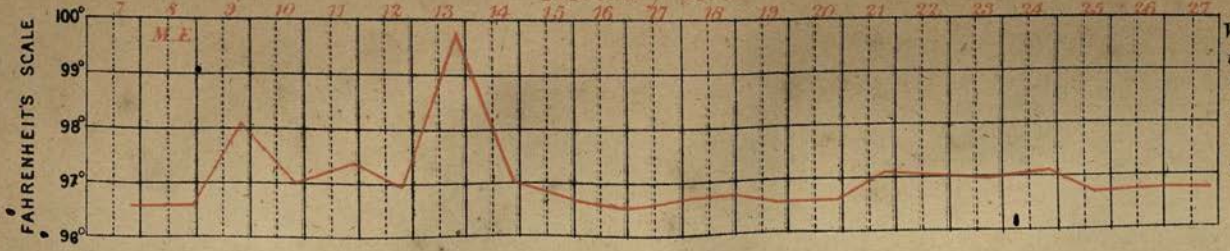
100°
99°
98°
97°
96°

Elevation of temperature on 29th 30th and 1st was coincident with a severe attack of Dysenteric Diarrhœa

Vincent Brooks, Day & Son, Lith.

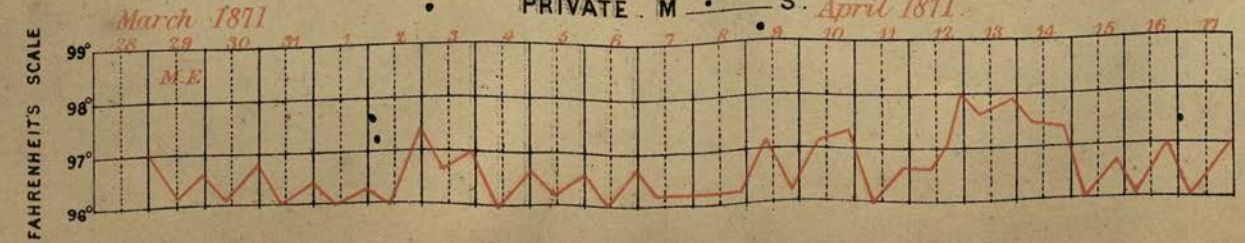

October 1871.
SERGEANT L____S.
FAHRENHEIT'S SCALE
99°
98°
97°
96°
18
19
20
21
22
23
24
25
26
27
28
M.E
March 1872.
PRIVATE. S____H.
FAHRENHEIT'S SCALE
99°
98°
97°
96°
18
19
20
21
22
23
24
M.E
Vincent Brooks, Day & Son, Lith.

PRIVATE. H____R.



Was slightly under the influence of liquor on the 9th and 13th when temperature was taken

PRIVATE. M____S.



Vincent Brooks Day & Son Lith.

In this instance the degeneration of the unabsorbed pneumonic exudation seems to have supplied the material for inoculation.

Thus can the varieties of consumption be legitimately classified according to the source of infection, and this appears more reasonable than to borrow from the accidental characters of the morbid substance, or the structural injuries inflicted by its presence, names for the subdivisions of the disease.

With reference to the composition, colour, and consistence of tubercle, it will be necessary, in support of the view that all tubercle has a common source, to prove that the distinct varieties hitherto pourtrayed are but the same substance modified by the greater or less rapidity of its formation.

"Tubercle," says Lionel Beale, "when first formed consists of germinal, or "living, matter; but that which is usually termed tubercle consists of the pro- "ducts resulting from the death of these."

Dr. Williams thus specifies each step in the process of change. "In both "cases the death and destruction of the tissue (adenoid) is preceded by indura- "tion, and the microscope reveals the nature of this induration in the abundant "production of cells which change their colour from red to *grey*, and eventually "so press on each other, and on their containing fibrous stroma, as to choke "their nutrition, and they then become cheesy, that is, undergo fatty degenera- "tion and disintegration. These cells have the closest resemblance to leucocytes, "the ordinary corpuscles found in lymph, and circulating also in considerable "numbers in the blood, and there are good grounds for believing that *these all "are identical in nature.*"

Dr. W. Moxon has, in the "Medical Times and Gazette," January 21st, 1871, concisely expressed the identity of grey and yellow tubercle, showing that the apparent distinction is but a difference in intensity of formation,—"the absence "of a grey stage is due to high intensity, the presence of a grey stage to low "intensity of the tubercle—a lower or higher degree, not a different kind,— "just as in inflammatory lymph we get a plastic, pellucid, greyish matter, "called plastic lymph, or a yellowish, opaque, solid or liquid substance called "puriform lymph, or pus." And again, in explanation of the yellowness which appears in the centre, or oldest part of the grey tubercle, "You will "find, I believe, after examining specimens very carefully, that the yellowness "of grey tubercle is a fatty degeneration of, and breaking up of, the elements "of grey tubercle."

Dr. Henry Green, senior physician to Charing Cross Hospital, also pronounces the primary infectant to be the same in both kinds of tubercle, and says:—"Granting that both the small-celled (grey), and the epithelial growth "(yellow), are the direct result of the irritant derived from the *focus of infection*, "it may be asked, how is it that this irritant produces, in some cases, the one "form of lesion, and in others the other? To this I reply that the *nature of "the lesion depends on the severity of the irritant.* The more severe the irritant "the greater is its tendency to produce epithelial proliferation; the less its "severity the more does its influence tend to be limited to the elements imme- "diately adjacent to the blood-vessels and lymphatics. The firm grey nodule "which consists of small-celled tissue, and which is in the main an inter- "alveolar growth, I believe to be the result of an irritant of less severity than "that which gives rise to the majority of the yellow nodules."—*Medical Times and Gazette*, October 26th 1872.

All tubercle, therefore, primarily invades, and subsequently radiates from, the same structure, implicating, however, other tissues in its spread, and likewise owes its colour and consistence to the force with which it has been forged, whether at a high heat, or a lower intensity.

The mode of its softening, too, depends not only upon the intensity of its first formation, but upon the constitutional viability of its elementary atoms, which, if not much degraded from the standard of health, may cause but little irritation or infection to the adjoining adenoid substance, and may thus extend only slowly, retrograding gradually in its oldest part towards caseous decay.

While, on the other hand, if the original cells entering into its composition be the product of a scrofulously devitalized system, rapid infection of the adjacent absorbent tissue, speedy disruption of the mass, and much local irritation must ensue. To these causes must be added also the influence of external agencies in the production of catarrhal inflammation round the

tubercle, since such inflammation, however brought about, means the dilatation of the capillaries, and the stagnation in them of blood charged to excess with leucocytes ready to escape, and which, when thrown into the infectious locality, will carry the disease of proliferation into such portions of the lymphatic structure as may strive to absorb them.

Having endeavoured by an analysis of the microscopic anatomy of the disease to establish the septic link between inflammation and consumption, whether the determining element be originated constitutionally, generated locally, or received from without, it is intended further to enquire how far the clinical history and hygienic accompaniments of consumption justify the foregoing conclusions.

Much has been written on the possible recognition of a pretubercular stage in phthisis, merely shadowed forth as it is by acid dyspepsia, disinclination to eat fat, and incipient malaise, but allusion has not heretofore been made to a not inconstant, possibly always constant, evidence, which is at once the earliest and most appreciable sign—*an inability* on the part of the person in whom the requirements for the development of tubercle exist, and are about to be set in motion, *to maintain the temperature of the body up to the natural standard*—the deficiency amounting to about one degree Fahrenheit in the morning, and to ·5 of a degree in the evening reading.

The value of this sign first forced itself into notice by its having been accepted as a distinct proof of the non-existence of phthisis, the received typical readings indicative of the disease being those that invariably exceeded the natural standard at night; men, therefore, having many of the obscure premonitory symptoms, but without any of the physical signs, were, in consequence of the low temperature, confidently pronounced to owe their delicacy to some other cause than incipient consumption; yet the result unexpectedly proved that the disease had been latent at the time.

Attention was thus drawn to this peculiarity of the heat-producing functions during the preliminary period when the bioplasm was being degraded to the required level, and observation corroborated what accident had suggested.

Dr. Sidney Ringer recognises a *persistent elevation* of temperature as the invariable *precursor* of the growth of tubercle in any organ, and says that this persistent elevation of temperature existed for several weeks before diminished weight, or other physical signs indicating the growth of tubercle in the lungs, could be appreciated. (*Aitken's Practice of Medicine*, vol. 1, p. 769.)

To call several weeks before the existence of appreciable signs a *pretubercular* stage is to assume a capability of diagnosing the deposition of the first tubercular atom which experience scarcely warrants. Dr. Ringer's observations are evidently coincident with the initiatory exudation before it reached an otherwise appreciable quantity, and are most valuable as a test of the laying down of the primary germs, but are *subsequent to the pretubercular stage.*

In each of the cases of which the thermometric diagrams are here affixed, the early apprehensions created by symptoms of debility, and by abnormally low temperature, were subsequently confirmed by the result.

No. 1. Private S——t, aged 31, found to have a low evening temperature in February, 1869, was invalided for incipient phthisis in May 1869.

No. 2. Private C——n, observed to have a low temperature in June 1870, is now under treatment, October 1872, for tubercle in apex of right lung, and for what seems to be, from the excessive irritability of the bowels, tubercular disease of the intestinal glands.

No. 3. Private H——r, aged 28, low temperature noticed in February 1870; discharged, having incipient phthisis, in April 1870.

No. 4. Private M—— s, aged 20, low temperature registered in March 1870, known to have tubercle in May 1871. Deserted in August 1871.

No. 5. Serjeant L——s, aged 36, low temperature in October 1871. Invalided for tubercle in August 1872.

No. 6. Private S——h, found to have a low temperature in March 1872, has, in November 1872, want of resonance under right clavicle, bronchophony, and deficient expansion of lung tissue on inspiration.

It will from this be seen that of the six instances advanced as examples of this fact, three were subsequently invalided for tubercle. One deserted when

known to labour under the same, and two are now under treatment for the disease.

There are therefore good grounds for believing that the deteriorating process, through which the constitution passes to fit its elements for the formation of tubercle, is one in which the heat producing powers of the system are lowered, and this will explain the extreme susceptibility of those who threaten phthisis to the evil influence of chills.

Yet further; not only is depression of animal heat the precursor of recognisable tubercle, but it will be hereafter shown that, long after deposit has taken place, diminution of temperature below the normal standard is frequently present during those intervals of local quiescence which occur between attacks of inflammation around the morbid substance.

To elucidate the cause of this defective warmth, it must be remembered that three factors are indispensable to the production of animal heat—oxygen to consume, material to be consumed, and an indefinable "trophic" nervous power, which presides over the construction and decay of living tissue. Here then comes into play the preliminary dyspepsia of phthisis, which is evidently the result of nervous debility, and this debility, besides deteriorating the crude elements of nutrition at their source, is reproduced within the lungs by reflection through the pneumogastric nerves; or, it may be, is originally transmitted from the threatened lung to the sympathising stomach; for so reciprocal are the various acts at either terminus of these mysterious nerves, that isolation of effect from cause becomes impossible.

Experiment has, however, proved that irritation of the pneumogastric nerves gives rise to diminished heat, while the sympathetic, under like circumstances, affords an increase. And this may account not only for the early loss of heat, but for its persistent augmentation in the later stages, when the sympathetic becomes involved in the universal irritation of the established evil.

The diagnosis of this very initiatory state is however of more importance to the physician in civil life than to the military surgeon, since it is just that time at which proper adaptation of climate may postpone, if not entirely counteract the development of the disease.

This then may be called the first thermometric period of phthisis, and in the unchecked form is invariably succeeded by a second and third, which are much more defined, and leave no doubt on the mind of the observer.

The second thermometric period is unmistakeably marked by a series of readings above the natural standard (98°) in the evening, and at, or below, that standard in the morning, a diurnal wave of fever passing through the system.

The causation of this ebb and flow of heat is amongst the most subtle questions in physiology. Nor does its occurrence belong exclusively to the second stage of phthisis, but is met with in typhoid fever and in pyæmia, diseases having many other features in common with consumption, and which are not unfrequently succeeded, almost in the relation of cause and effect, by consumption.

It has long since been admitted that elevation of bodily heat is an evidence of diminished, and not of increased, nervous power.

In the closing moments of life, the thermometer usually stands the highest.

The experiments of Brown-Seguard have shown that interference with the functions of the sympathetic gives rise to increased heat in the part to which it leads.

Dr. Handfield Jones designates the abeyance of nervous function to which he attributes the high temperature in heatstroke, "paresis of the sympathetic." And I have published elsewhere ("Medical Press and Circular," March 17, 1869) an instance of temporary hemiplegia produced by loss of blood succeeding an abortion, in which, although the temperature on the paralysed side was previously lower than on the other, yet on the accession of an intermittent fever, it rose on the paralysed side even above the fevered heat of the unaffected parts, proving that depression of the nervous power favours the evolution of excessive heat.

Part of the duty of the nervous system is doubtless to control the expenditure of heat, and as each body can elaborate but a given quantity of

nervous current daily, and that in proportion to the soundness of its health, it follows that any morbid diversion or unnatural induction of that current by the action of an irritant must, especially where weakness has diminished the total stock, leave the amount at evening so reduced that till nutrition, supplemented by repose, restores the balance, the heat-expenditure cannot be controlled.

That such repose plays a most important part in recouping the exhausted nerves is established by the investigations of Professor Pettenkofer ("Medical Times and Gazette"), who has found "that large quantities of carbonic acid are produced during the day, whether we work or not, and that the *absorption of oxygen during the day is comparatively trifling*, while at night, during sleep, large quantities of oxygen are absorbed, and stored up in the system in order to enable us to compensate the previous extra waste of oxygen, and to be again prepared on the day following for the requirements of waking life."

It will be seen, too, in the annexed diagram of the hourly readings of a consumptive patient's day, that the gradual increase of heat from 11·30 A.M. to 5·30 P.M., becomes, as might be inferred from the cumulative fatigue, suddenly augmented from 5·30 P.M. to 7·30 P.M.

Again, it has long been noticed that in all convalescents, during the transition from a fevered to a healthy state, the reduction of temperature does not take place suddenly, but by gradual declensions, which are invariably *more marked at morning*, thereby showing the controlling power of nervous force accumulated in sleep.

Undeniably, then, in a consumptive person the exertion of wakefulness, plus the peripheral irritation of the developed tubercle, is sufficient to cause such expenditure of nervous current throughout the day that there results, at evening, exhaustion and augmented heat; but the refreshment of sleep so replenishes this vital force, that at morning the temperature of the morbidly sensitive body is again depressed.

In several cases of tubercle induced by the slowly-acting deleterious influence of the Indian climate, the constitution became so habituated to its existence that the characteristic, high and low, readings of the second period were only present when inflammation round its circumference, softening, or hæmoptysis occurred; and, on the contrary, the system, in the intervals, returned to the pretubercular condition of abnormally low temperature, affording thus a further proof that the increased heat is the result of the irritative changes set up by the tubercle when the nervous power has been diminished.

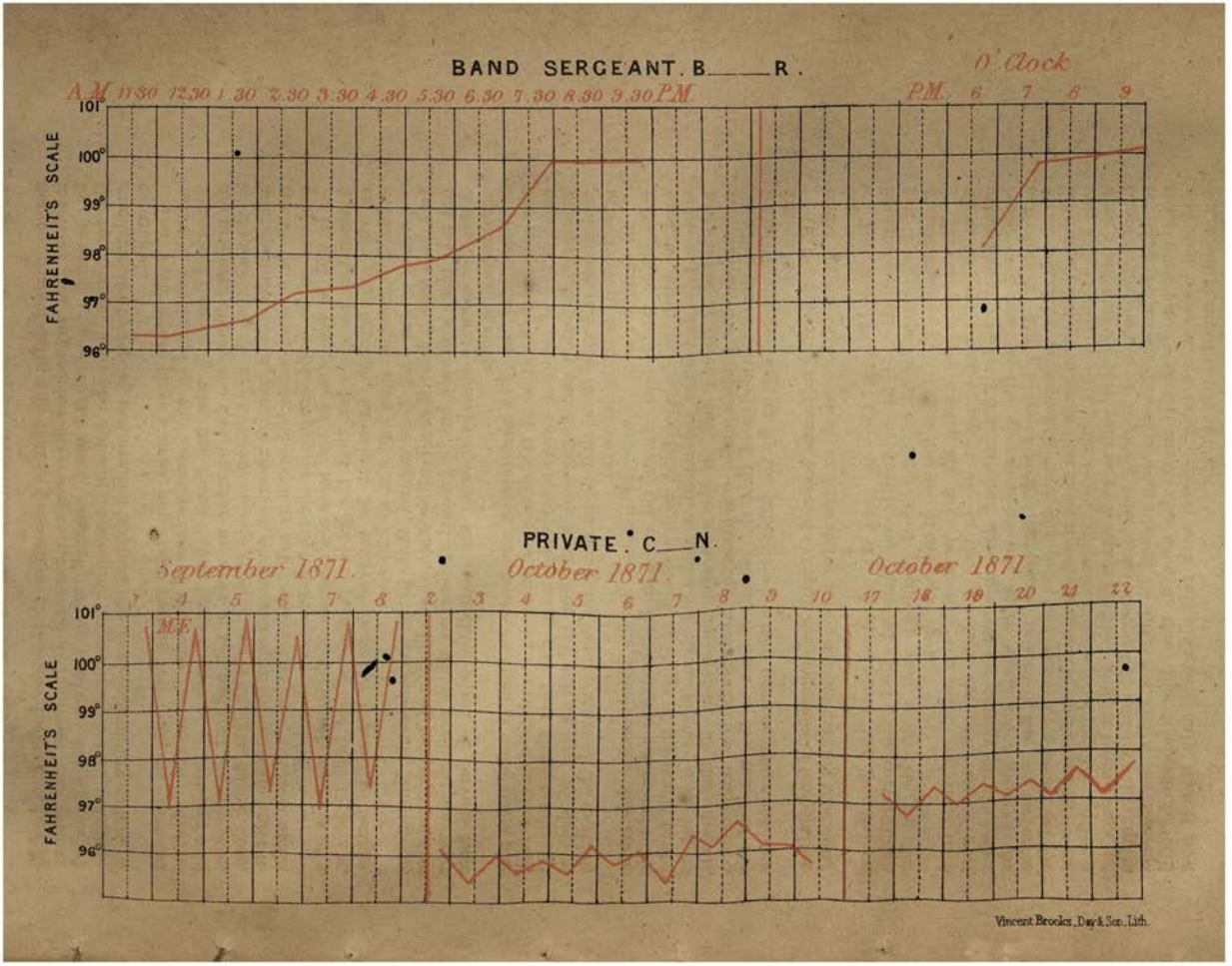
Of the following instances, selected to typify the depression of temperature in the absence of congestion, or destructive action around existing tubercular deposit:—

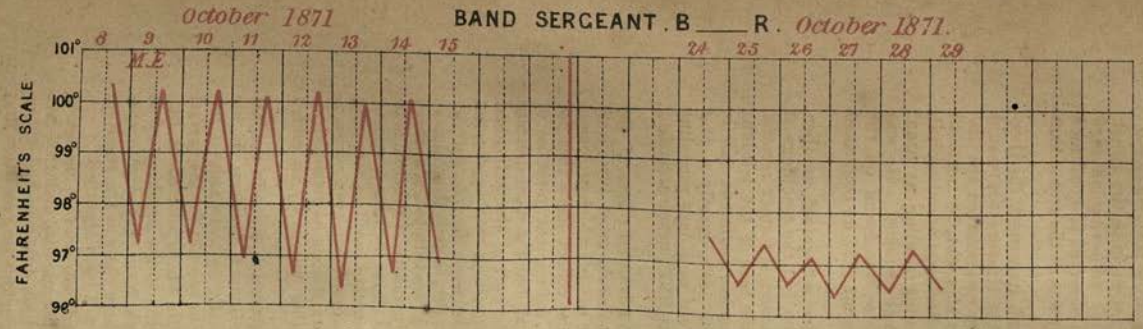
The first, Private C——n, aged 30, admitted into the hospital on September 2nd, 1871, for bronchitis, was found to afford a temperature (high and low) symptomatic of established phthisis; and, with this, to offer unmistakeable signs of consolidation of the right apex.

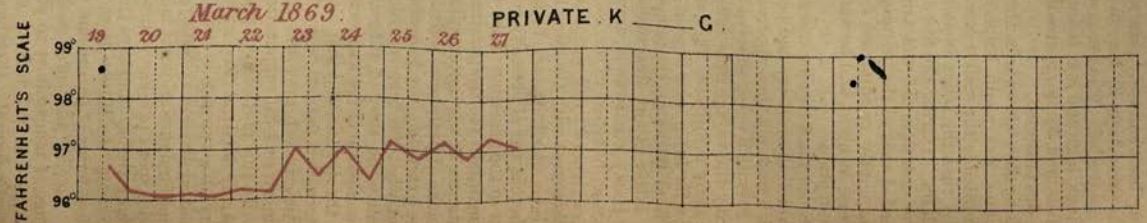
The temperature during six days presenting the usual variations from about 101° at night to about 97° in the morning, the observations were discontinued. Exactly a month had elapsed, when the change for the better being very marked, the thermometer was again used, and registered the extraordinary temperature of 96·2°. Supposing this to be due to some error which would be subsequently corrected, the observations were continued for nine days; but throughout that time, the evening and morning readings were only a little above and a little below 96°, never once touching 97°. After a week's omission the observations were again renewed, and for twelve days the temperature, night and morning, remained between 97° and 98°, never quite reaching the latter. Ten days were allowed to intervene, and a few observations were again taken; these also showed that the temperature still remained between the same degrees, with this difference only, that it now sometimes attained to 98° at night.

Afterwards, however, the temperature crept gradually upwards till it became persistently high at night, and the man has since been discharged from the service for advanced phthisis.

Again, Band-Sergeant B——r, 32 years of age, and had been thirteen years in India, was found on examination for re-enlistment four years ago,


BAND SERGEANT. B____R.
A.M. 11.30 12.30 1.30 2.30 3.30 4.30 5.30 6.30 7.30 8.30 9.30 P.M.
O' Clock
P.M. 6 7 8 9
FAHRENHEIT'S SCALE
101°
100°
99°
98°
97°
96°
PRIVATE. C___N.
September 1871.
October 1871.
October 1871.
1 3 5 6 7 8 2 3 4 5 6 7 8 9 10 17 18 19 20 21 22
M.E.
FAHRENHEIT'S SCALE
101°
100°
99°
98°
97°
96°
Vincent Brooks, Day & Son, Lith.





Vincent Brooks, Day & Son, Lith.

Feb. 7, 1868, to have distinct evidence of solidification of the apex of the right lung, but was by authority specially re-engaged in consequence of his great proficiency in performing and teaching music.

On the 4th October 1871, he was for the first time taken into hospital, having been suddenly prostrated by profuse hæmoptysis.

In three days, by the effect of rest and the use of astringents, the attack was controlled. The temperature taken during the week following afforded readings, high and low, indicative of the usual condition observed in confirmed phthisis, and, being apparently uninstructive, the registry was at the end of that time discontinued.

Nine days afterwards, the general health having much improved, the thermometer was again employed to ascertain how far the temperature would acknowledge the visible gain, and with no little surprise was received the discovery that the index in this case also could not, even at night, be made to reach 98°. During the five succeeding days prior to his discharge from hospital, on no occasion did the temperature, though the evening reading as usual exceeded that of the morning, ever ascend to the normal standard. He was subsequently re admitted for debility; the temperature was found on the increase at night, and he was ultimately invalided in August 1872 for confirmed consumption.

Since the foregoing cases were noted, and their value recognised, another, of which the registry had been made as far back as 1869, but the teachings of which were not then appreciated, has been discovered amongst former records.

Private K——g suffered from pleuropneumonia at the base of the left lung during the voyage from India in December 1867, was under treatment still in the early months of 1868, and was invalided in March 1869, exactly a year later, for tubercular deposit in the left apex. During the nine days preceding his final discharge, the temperature ranged from 96·1° to 97·2°, never exceeding the latter at any observation, evening or morning.

Hasty conclusions, drawn from the study of very advanced stages of the disease, have led to the belief that the existence of tubercle must invariably be evidenced by elevation of temperature, whereas the records which prolonged intercourse with the same individuals has enabled me to collect, show that not only is the initiatory diathesis of phthisis and the subsequent presence of tubercle, not of necessity coincident with increased heat, but the most delicate test of the accession of the former is an inability on the part of the individual to maintain the temperature up to the natural standard; and that in chronic instances of the latter, during the quiescent intervals between the intercurrent attacks of peripheral inflammation which mark its exogenous growth or ulcerative extension, the temperature falls even below 98°. From this, too, it appears that what has been regarded as the characteristic temperature of tubercle is in reality the sign of tubercle *plus fever*, whether that fever be the transient accompaniment of a superadded bronchitis, or the permanent result of softening of the deposit, and that chronic tubercle may exist and probably even accumulate with a natural or possibly a depressed temperature, so long as general irritation is not provoked in the unnaturally susceptible system by an added ailment or local suppuration.

To this part of my subject I would invite special attention, since in the last "Army Medical Report" (1870), Deputy Inspector-General Maclean, in his very able synopsis of the information afforded annually by the wards of the medical division at Netley, confesses himself at a loss to account for the arrival from foreign stations of men in a fair degree of health, whose antecedent histories speak of "loss of flesh and nightsweats, and point to the breaking up of "lung tissue," and says that, "in the absence of cough, fever, and *high tempe-* "*rature*," he thinks it more reasonable to regard these cases as the result of "low forms of pneumonia with exudation which has not been absorbed."

Now, of the three cases which I have chosen to illustrate this deceptive range of temperature in phthisis, one only had had pneumonia, and this had occurred at the base of the lung, in the apex of which tubercle had subsequently formed; therefore, although the previous pneumonic condition may have supplied the infection requisite for the production of tubercle, the anterior existence of the former cannot explain away the actual presence of the latter at the time of the temperature being registered.

In the other cases every requirement in sign and symptom of *bonâ fide* tubercle was present, one having been under observation four years, and the other for many months.

Again, pneumonic exudation can only be considered as such so long as it continues a fixed, non-extending carnified mass, but where such changes take place in its substance as to decompose it into a source of inoculation to the lymphatics of the lung, then it can no longer be regarded as pneumonic exudation, but must be looked upon as a focus of tubercular infection.

One thing is certain, that the possibility of solidification of *the apex* of the lung being coincident with a *temperature not above natural*, which my thermometric observations had previously proved to be the case, has now been corroborated in the experience of Deputy Inspector-General Maclean.

Furthermore, I find that Assistant-Surgeon Boileau, 29th Regiment, had at a still earlier period noticed this peculiarity, since, in a very interesting paper on the "Correlations of Temperature, Pulse, and Respiration in Phthisis." "Army Medical Report, 1868," he says, "I may state, however, that I have "taken *several normal evening temperatures in phthisical patients.*"

This, therefore, is a variation from the routine temperature of phthisis which may, if not anticipated, throw difficulty in the way of diagnosis.

In the third thermometric period the uncontrollable induction of the already deficient nervous force, in answer to the persistent irritation of the advancing destruction in the pulmonary tissue maintains a temperature which, though fluctuating between a high morning and a higher evening reading, never again sinks to the normal standard.

The records of this stage are so unvarying that a single instance will represent the type.

Private G——r, bandsman, aged 34, had been thirteen years in India. Although both lungs were much broken down by tubercular softening, he struggled to do his duty in the band till almost at the point of death. He was admitted in a sinking state on April 18, 1869, and died on the 31st of the same month.

From the 17th to the 24th inst., his temperature oscillated between 103·8° and 100°, but never sank below the latter.

Having thus endeavoured to strengthen the present means of diagnosis by recording the facts in relation to temperature with which my own observations have furnished me, and which have up to the present, to a great extent, escaped all notice, I shall omit all allusion to the auscultatory and other signs, to which I can add nothing that has not been already laid down by various authors on this subject, but shall pass on to the consideration of the hygienic conditions which tend to produce phthisis in the ranks of the army.

An admitted and most potent source of this disease is *overcrowding*.

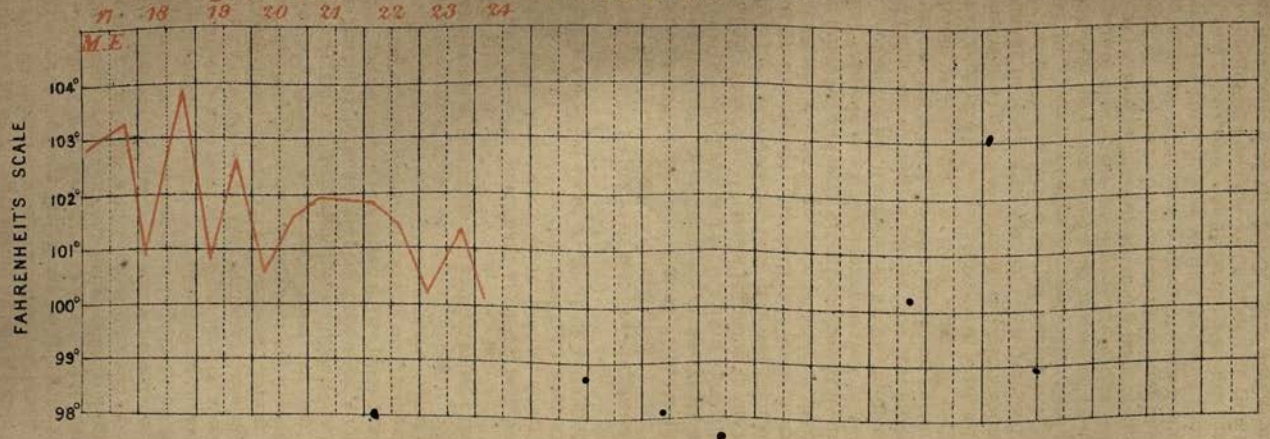
That it should be so, the demonstration of the precipitating effect of carbonic acid on the blood corpuscles by Dr. Burdon Sanderson, and the acknowledged influence of impure air on the leucocytes, whether infecting them on the surface of a wound, or reaching them by lung inspiration, renders easily intelligible.

That such unwholesome atmosphere must still continue, to no inconsiderable degree, in not a few barracks, notwithstanding the great advance of late years made in housing troops, will be a necessary conclusion if it be remembered that 600 cubic feet of air per man is ruled to be sufficient, *when* supplemented by a given amount of ventilation, but that the mechanism for this ventilation is so constructed that it creates a concentrated draught, and that the means of closing the ventilators are within easy reach.

To any one who has ever entered a fully occupied barrack room at winter-midnight, it will have been conceivable how impossible it would be for the leucocytes on the surface of a wound to accomplish their cicatricial functions amid such infected air, how easily they could become degraded and imbue the system, and consequently to understand how dangerous must be an existence, during one-third of which—eight hours in twenty-four—this atmosphere is brought in contact with the blood. The weaker must, and do, succumb. The experiences of the tent-hospitals in the Franco-Prussian war, to which air was so freely admitted, teach us how much ventilation can be well borne even amid the shock of wounds. Since, then, it is perfectly impracticable to con-

April 1869.

PRIVATE C_____R.



Vincent Brooks Day & Son. Lith

struct any building in which men can be healthfully located at the rate of 600 cubic feet per man without such change of air as must keep down the temperature more nearly to that outside than would seem comfortable, the difficulty should be boldly faced, the required ventilation should be scientifically estimated *at its full*, the ventilators made and fixed immoveably, and then so much extra bedclothes given as will prevent discomfort in the night.

When twelve men spend the entire portion of their lives, during which Professor Pettenkofer says that "large quantities of oxygen ought to be absorbed and stored up in the system in order to enable them to compensate "the previous extra waste," in a room equal to twelve times 600 cubic feet, and in which the same air is allowed to continue so long in apposition with their bodies as to become warmed by the heat radiated from them, there must also be an equal equivalent of accompanying excreta, and therefore in such a case the season specially set apart for storing oxygen is spent in accumulating pulmonary infection.*

The plan of ventilation which would seem most likely to accomplish change of air with a minimum of draught is that procured by free openings in the outer wall of every room at the part between its ceiling and the joists of the room above; through large central gratings in the ceiling the air would have an entrance if the stove below was drawing, or an exit when all else was closed. The size of the gratings and the fineness of their innumerable openings would diffuse the air more equably than those at present used, and so expand the draught.

The facts and statistics to be found in Dr. Parke's book on Hygiene, and in the Medical Report by Deputy Inspector-General Maclean before alluded to, place the question of the effect of overcrowding beyond doubt, and leave little to be added thereto.

There is, however, another, and a still more potent cause of phthisis in the army which has hitherto been obscured from recognition by the dogmatic assertions of former writers on this subject, but which is now forcing itself on acceptance through the carefully compiled statistics of the Army Medical Department.

I mean the deleterious influence of malaria and excessive heat on constitutions which have subsequently to encounter a sudden change to the cold and damp of the English climate.

Deputy Inspector-General Maclean, in the report quoted, writes, "Phthisis, "as might be expected, ranks as our most fatal disease. The opinion put "forth by Boudin, by Kepple, by Drake, and others, that phthisis is a rare "disease in malarial climates meets with no support from our experience at "Netley. British troops serving in the most malarious climates of India enjoy

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* Since this was written, the following very remarkable exemplification of its truth has come to my knowledge.

In a town in the South of Ireland, a pensioned policeman, adding to his income by civil employment, maintained in comparative comfort a wife and twelve children.

They lived in a small two-storied house, consisting of four rooms, two on the ground floor and two beneath the slates; the former were used, one as a kitchen, the other as the bedroom of the parents and youngest child, an infant; the latter were the sleeping rooms of three boys and eight girls respectively.

That in which the eight girls slept measured 14 feet by 15 feet, and had, allowing for the sloping roof, an average height of 6 feet, making its cubic contents 1260 cubic feet, and the average cubic space for each occupant 157 feet. Its only window was a skylight 2 feet by 15 inches, which was invariably tightly closed at night. There was no fireplace or chimney in the room, nor any other communication whatever with the outer air, so that this apartment in which 157 cubic feet of air was allotted to each of the eight girls, was virtually hermetically sealed.

In February 1871, one of the girls, aged 14 years, became ill. Loss of appetite and languor was soon followed by cough, bloody sputa, and general wasting.

A second, aged 13 years, two months later, became similarly affected. In May 1871, the first sufferer died, and before the conclusion of the same year six of the eight had fallen victims to acute tuberculosis.

A valid proof of the influence of nocturnal overcrowding, and a strong testimony in favour of the present suspicion that the concentrated exhalations of the diseased may become a source of infection to the healthy.

"no exemption from this disease. *On the contrary*, there is much reason to "believe that the depressing effects of the malarial poison on the constitution "is a powerful aid to the vitiated atmosphere of barrack-rooms in at least "predisposing to this disease."

Such is the conclusion established by the inspection of invalids from every part of the British possessions; but as prolonged service in the same regiment has enabled me, not only to compile from its records, but to fix by personal acquaintance the medical career of each man, I hope by following out the histories of all those who had been in India and returned with the regiment from thence, to prove incontestably that residence of a certain duration in India, followed by return to the English climate exceeds, in its power of producing phthisis, the known effects of the most destructive trades.

Tabulation of the phthisical history of the regiment during a period of eight years, from 1864 to 1871 inclusive, comprising therein the four concluding years of its sojourn in India and the four succeeding its return to England, and admitting into the figures only those who had served in India, will disclose an induced liability to this disease that is little less than appalling, and which has heretofore disappeared from observation, owing to the rate of death and invaliding being invariably calculated on the combined total of returned Indian men and newly-joined recruits.

TABLE OF PHTHISIS in the —th Regiment while serving in *Bengal* during the Four Years from 1864 to 1867 inclusive.

Date.	Strength.	Number invalided and died.	Rate per 1000.	Average residence in India.	Average age.
1864	891	11	12·3	7·5 years.	26·8
1865	796	7	8·7	9·0 „	30·0
1866	788	1	1·2	1·0 „	33·0
1867	657	3	4·5	7·0 „	29·0

AVERAGE of the Four Years.

Strength	783
Invalided and died	5·5
Rate per 1000	6·6
Average residence in India	6·1
Age	29·7

TOTAL PHTHISIS for the whole of India in 1869.

Invalided from Bengal in 1869	4·4 per 1000	
„ „ Madras „	4·1 „	
„ „ Bombay „	3·2 „	
Deaths in Bengal	2·0 „	not distinctly given in Report.
„ „ Madras	1·0 „	
„ „ Bombay	1·3 „	

TABLE OF PHTHISIS among men of the —th Regiment, returned from India and serving in *England* during the Four Years from 1868 to 1871, inclusive.

Date.	Strength.	Number invalided and died.	Rate per 1000.	Average residence in India.	Average age.
1868	448	6	13·3	10·0 years.	31
1869	365	11	30·1	8·5 „	32
1870	293	9	30·7	9·0 „	32
1871	260	6	23·0	10·5 „	34

AVERAGE of the Four Years.

Strength	341
Invalided and died	8·0
Rate per 1000	24·2
Average residence in India	9·5 years.
Age	33·0

TOTAL PHTHISIS for all Regiments serving in *England* in 1869.

	Loss per 1000 by		
	Death.	Invaliding.	Death and Invaliding.
Household Cavalry	4·93	11·51	16·44
Cavalry of the Line	1·64	4·54	6·18
Royal Artillery	2·53	5·81	8·34
Military Train	61	6·69	7·30
Foot Guards	2·66	10·28	12·94
Infantry Regiments	2·06	5·45	7·51
Depôt Brigade, Royal Artillery	2·50	6·25	8·75
„ Battalions	4·77	9·45	14·22

From the foregoing tables it will be apparent that the average yearly loss in the —th Regiment from 1864 to 1867 by invaliding and deaths from Phthisis—6·6 per 1,000—corresponded as nearly as possible to the 1869 total average for Bengal, in which Presidency it had been located, and is conclusive therefore that no special cause of the disease prevailed in this particular regiment while in India; yet on its return to England the rate of death and invaliding amongst those who had been in India reached, during the 2nd and 3rd years after arrival, the enormous proportion of 30 per 1,000; and the mean total inefficiency thereby caused during the four years in England, from 1868 to 1871, was 24·2 per 1,000, being more than three times the loss per 1,000 of the aggregate infantry regiments on home service (7·5).*

This extraordinary disparity between the prevalence of phthisis among

* *Extract from the Annual Report of 35th Regiment for* 1872.

"The loss by invaliding and deaths from phthisis during the past year (1872) "has been eight, giving a proportion of 10·9 per 1,000 on the average strength.

"The regiment is, however, composed of, as nearly as possible, 220 old soldiers, "who had been in India, and 529 men who have never served out of England. The "loss among the latter has been but one invalided and one death, or at the rate of "3·7 per 1,000; while, on the other hand, the loss among the returned Indian men "has been one death and five invalids, or at the rate of 27 per 1,000. With the old "soldiers has been included one of only two years' service, but who, being a soldier's "son, has spent more than ten years of his boyhood in India; and another who had "belonged to the East India Company's service before enlistment in the 35th "Regiment.

"The records of the past year, therefore, have coincided with those of the "previous four which have elapsed since the return of the regiment to England, in "proving that by far the greatest number of consumptive cases have occurred in "men who have been in India, that the propensity to the disease is in proportion to "the duration of residence in that country, and that the rate of liability between the "returned Indian men and those who had never left England is as that of the "most destructive mining trade to a healthful occupation.

"These records also show that by the prolonged action of the Indian climate a "constitutional condition is developed, which, under the ordinary exciting causes of "English seasons, becomes many times more prone to phthisical degeneration than "would have been the case during continuous residence in Great Britain, since even "the disadvantages of abnormal stature, of severe night duties, and of uninterrupted "location in large cities, under which the household troops labour cannot bring up the "rate of loss among them from invaliding and deaths by phthisis to anything "approximating that which is found to prevail among returned Indian soldiers."—*Sheffield, February 17th*, 1872.

those who had been in India, and the mixed rank and file of regiments recruiting up to strength on home service, being as 24·2 to 7·5 per 1,000, cannot be accounted for by the smallness of the numbers under observation, nor can it be explained by partition of the cases under other heads of pneumonic degeneracies, &c., as suggested by Deputy Inspector-General Maclean, with reference to some of the instances of solidified apex at Netley (in consequence of the absence of fever and high temperature, at a time when the general health had been much improved by a sea voyage), but must be held to represent "destructive lung disease, included under the head of pulmonary consump-"tion, as seen among soldiers," and developed in them by climate and malarial causes.

Were further proof required, the strange discrepancy existing between the rate of death and invaliding for phthisis in depôt battalions, and in regiments of infantry on home service, would afford the information needed.

The loss in depôt battalions to that in infantry regiments in the United Kingdom is as 14·2 to 7·5, and consequently exhibits the presence in the former of some cause which all but doubles the proportion.

As depôt battalions are made up of men returned from the foreign stations of their regiments—8-10ths of which must of necessity be in India—and of recruits of short service, it is obvious how extravagant must be the loss among the former, when even the influx of healthy young recruits to swell the total from which this ratio has been deduced, cannot bring down the average to less than double that of regiments on home service.

A record kept in every depôt of either class would quickly bring to light the immense expenditure by this disease which Indian service subsequently causes, and which has been hitherto submerged from view, amid the combined totals of old and young soldiers.

Since then the proportion of phthisis in depôt battalions, even including in the numbers the young soldiers who are at their quinquennial period of lowest mortality, is double that of regiments in the United Kingdom, there can be little doubt that, were the figures drawn from those alone who had been on foreign service, the relation which they would bear to the regimental ratio would be more nearly as 24·2 than 14·1 to 7·5, and would closely coincide with and corroborate what I have found to be the case amongst the returned Indian men of the —th regiment.

Lest, however, any supposition might arise that some erroneous handling of the figures, or oversight of causes, had led to a false conclusion, a further and still more expressive proof is contained in the fact that the mean average loss by phthisis among the old and young soldiers collectively, of the —th regiment during the four years in England, was 15·3 per 1,000 exceeding by only 1·2 the usual rate in depôt battalions; and that during the last of the four years the average had fallen in the regiment to 7·9, being within a decimal of the rate in the aggregated regiments in the United Kingdom.

It is evident, therefore, that the regiment, in the years succeeding its return from India, passed through the phthisical position of a depôt battalion, down to the more exempt condition of a regiment on home service, and that this lessened prevalence of the disease kept pace exactly with the weeding out of the old soldiers and the influx of young recruits, thereby demonstrating most indisputably that the excessive liability existed among the returned Indian men. Moreover, it may be further added, that in three out of eleven post-mortems on returned men, who had died from other causes, tubercular infiltration was unexpectedly discovered; also that several have taken their discharge by purchase, or time expired, in whom the disease was known to exist. A closer enquiry must therefore increase the already enormous proportion.

Since, then, these very men, who furnished while in India only the average rate of casualties from consumption common to all regiments in Bengal, have been proved, by isolating them from recruits and home-joined men, to have suffered from this disease during the four years succeeding arrival to a thrice greater degree than the proportion of all regiments on home service taken collectively, the question arises: Was tubercle developed in a slow insidious form in them during their Indian service, and brought to light by the transition to England? or was there originated merely a constitutional fitness for the degeneracy which the changed condition of life subsequently determined

to the disease? This is a point the estimation of which is beset by so many difficulties, and open to so many fallacies, that nothing can be dogmatically laid down; yet not a few important considerations go to support the latter view, and almost to establish the belief expressed by Deputy Inspector-General Maclean that "the depressing effects of malarial poison on the constitution is "a powerful aid to the vitiated atmosphere of barrack rooms in *at least predis-* "*posing* to this disease."

In the first place, although the regiment was thirteen years in India, yet the average length of service in that country of those who either died or were invalided from thence for phthisis, was but 6·1 years, whereas of those who became affected after the return of the regiment to England, the average Indian service had been 9½ years, therefore these men had passed the time at which it was usual for the disease to show itself in the country by 3½ years.

Again, the proposition that the former were cases of, so to speak, natural phthisis, while the latter were instances of its artificial production is strongly borne out by the statistics in Dr. William's work on "Pulmonary Consumption," where the average age at time of attack is shown to be 29·47 years, which differs only by a small decimal from the average age 29·7 of those who were attacked while actually in India; but the diminution of liability evident in Dr. William's tables between the ages of 30 and 40 years is met in the records of those of the same decade, 33 years, who had returned from India, by an enormous increase; and this again in a great measure corresponds with the facts relative to the artificial phthisis of miners, brought out by Dr. Parkes—"Practical Hygiene," p. 97—in which he says: "The "enormous increase of lung disease among the miners after the age of 35 years "is seen at a glance."

If, therefore, there exists so close an agreement between the proportion and ages of those attacked in India, and those who had never left England, while the ratio of the subjects of the disease among those who had returned from India to England is in excess of the average at the same time of life afforded by the statistics of the deadliest mining occupation at its most fatal decade, it is a strong evidence that in the action of the phthisis-giving influences incident to English service on a constitution which has been debilitated by a nine-years' exposure to the malaria and excessive heat of India, consists the most powerful known cause of consumptive lung diseases.

That the constitutional tone acquired in India is especially characterised by a proneness to pulmonary congestions was strikingly exemplified by the action of the rubeolar poison on those who were infected with measles immediately on the landing of the regiment in Portsmouth.

Of seven cases which occurred among the men and officers, five, all of whom had been for a considerable time in India, suffered from severe pneumonic complication; while the remaining two, one of whom had never been abroad, and the other had returned from India five years previously, were perfectly free from all secondary affection. Of fifteen children that were attacked at the same time, not one who had been born in India escaped inflammation of the lungs, and the majority died.

It is consequently evident that the enervating influences of excessive heat and malaria so far lessen the tension of the capillaries that they are not only easily dilated by an irritant into an inflammatory condition, but, owing to deficiency of nerve power they are unable quickly to regain their natural calibre, and hence the train of congestions for which returned Indians have long been clinically renowned; and which, when taking place within the lungs, help the transudation of impoverished and fever-poisoned leucocytes to lay the foundation of material that will, by its decay, infect the lung lymphatics engaged in an attempt at its removal.

This is yet more substantiated on inquiring, by reference to the medical histories of those who became subsequently phthisical, what diseases have most commonly preceded this final morbid state, since almost universally fever in its various intermittent and remittent forms is found to have been the prelude.

In each of the three most severe cases of remittent fever treated in India, I found again a consumptive patient in England; yet it can be but con-

jectured whether the tubercular proclivity invited the grave accession of fever or was a consequence of its invasion.

Two results of the fever-action go far to produce a condition favourable to phthisis.

The intensely high temperature which is sustained for the time, impairing if it does not altogether destroy the vitality of the leucocytes, and the changes wrought in the structure of the spleen.

To the influence of the morbid changes in this latter organ in connection with this subject no attention has as yet been paid.

Nevertheless, the action of malarial poison on the spleen speaks decidedly of the probable effect of the same agent on the lungs.

In Dr. Williams's book (p. 91), with reference to the results of inoculation, the following occurs: "In Dr. Fox's observations, the lungs were affected with "tubercle in fifty-nine cases out of sixty-four, the *same proportion as those* "*invading the spleen.*"

If, then, in the artificial production of tubercle another organ is found to be equally susceptible with the lungs, may it not be justly argued that there is some structure common to both, which is capable of being affected by like causes.

"The structure of the spleen bears a close analogy to that of lymphatic "glands" (Williams). And again: "In his second paper Dr. Sanderson "confirms his conclusion that the tubercles and consolidations artificially "produced in the various organs of animals consist essentially in overgrowth "and induration of the adenoid tissue naturally existing in the various parts of "the textures."

These little masses of a lymphatic character have been shown by Kölliker to exist in the human lung, and have been proved by Drs. Fox and Sanderson to be the seat of human tubercle. Hence, therefore, is demonstrated a direct structural similarity between the spleen and the tuberculisable parts of the lung, which explains their equal liability to the effects of inoculation. And from this proved community of behaviour with one class of morbid agents, it is allowable to infer that infection with malarial poison, which invariably more or less involves the spleen, must to some extent give rise to degradation of the lymphatic tissue of the lungs, and thus prepare the very site of tubercle for its reception.

If to this be added disorder of the splenic functions, connected as they are with the origin and life of leucocytes, and account be taken of weakened nervous power which causes loss of tone in the capillaries, depriving them of that resiliency which in health enables them to regain their former calibre when dilated by a passing irritant, the state of constitution consequent on the influence of heat and malaria is pourtrayed, and this, experience teaches, is threefold more prone to become consumptive than any which the English climate can produce.

To this presumption of the origin of phthisis further proof is given by the intrinsic evidence of the disease itself.

Dr. Williams says (p. 387), that the causation of consumption "is twofold, "and possibly more complex. Firstly,—The influences which excite and keep "up inflammatory affections of the lungs, the products of which are apt to be "of a lowly organized kind, tending to contraction or to caseation. Secondly,— "*Septic influences* which blight and corrupt portions of the bioplasm of the blood, "or *of the lymphatics*, and thus sow the seeds of decay.

"Consumption arising from the first class of influences is generally a limited "disease of one or both lungs running a chronic course, and is that which pre- "vails most largely in cold or temperate countries.

"Consumption arising from the second class is a disease with more marked "constitutional symptoms —is *tubercular*, and runs a more or less rapid course; "this type, as Dr. Guilbert has well pointed out, is the prevalent one *of hot* "*countries.*"

That the consumption from which the men under consideration suffered, resulted from blighting of the bioplasm of the lymphatic tissue of the lungs by septic malarial influences is fully demonstrated by every feature of the malady, both in those who died, and in those who were invalided.

In the majority of instances scattered and unlocalized deposit could be detected by the stethoscope before they passed by invaliding from under observation.

In a few the disease confined itself to one, or both, apices.

And in several the intermittent night and morning temperature proclaimed by the thermometer first drew attention to the real meaning of obscure lumbago pains, accompanied by unwonted constitutional debility; in these cases, although they had never suffered from pneumonia in any form whatsoever, consolidations were found to have formed in the base of one or other lung, and then on closer search, the front and upper parts proved to be becoming implicated too. Slowly the inexpansive portions became more and more discernable, and with their increase the strength went down, till death allowed the appearances of consumption to be read off at the post-mortem examination.

In seven post-mortems made on returned Indian men since 1868, the lungs were found invariably "riddled by little purulent depôts and *infiltrated throughout with tubercular nodules*," except in one instance previously detailed, in which the degeneration of previous pneumonic deposit supplied the subsequent source of infection, and in which the morbid mass confined itself to the apices and upper lobes, forming a continuous solid substance, but unaccompanied with disseminated nodules; this, by its isolated peculiarities, goes far to prove the common origin of the rest.

The general implication of both lungs, the insidious deposition of the tubercle, which in most cases did not incapacitate the man from duty till much of the pulmonary substance was involved, the comparatively advanced age of the patients, and their prolonged antecedent residence in India, together with the history of previous fever, all corroborate the theory of the induction of constitutional predisposition to phthisis by climatic causes; while at the same time the hard consistence and grey colour of the unsoftened tubercles place them in relation to those of inoculation, and also evince the slowness of their formation.

Wherein, then, consists in the return from India to England the last exciting cause?

Probably in the transfer from Indian heat to English cold, *supplemented by* the frequent variations of local temperature, to which the night duties of the soldier unavoidably expose him, and by the deleterious influence of overcrowding.

Prolonged exposure to a high temperature undeniably tends to depress the heat-producing powers of the body.

One of the earliest concomitants of impending phthisis, and one of the conditions of a system in which tubercle, though existent, is quiescent, has been shown to be an inability to maintain the heat of the body up to its full standard.

So far, therefore, the circumstances of the returned soldier are preparatory to the disease.

Dr. Aitken, in his "Practice of Medicine," affirms that the night-watchmen are particularly prone to phthisis. Much more, then, would such duties be most pernicious to those already so inclined.

Again, the very nature of the duty is harder on the soldier than the watchman, since, while the latter goes his rounds continuously until permanently relieved, the soldier, aroused from sleep in a heated guard-room to take his two hours' sentry-go, returns at its completion to the warmth, and is again called forth before the night expires to "go on" a second time, so that the demand for rapid accommodation of the system to alternate extremes of heat and cold is greater on the soldier than the watchman.

In further proof of the evil effects of quickly recurring changes from heat to cold, three of the seven deaths from phthisis, which happened with the regiment, took place in men who either, during the voyage home or subsequently, acted as regimental cooks, and were in consequence subjected to constant and excessive variations of temperature.

And, finally, the extraordinary immunity from the disease enjoyed both by the officers and women of the regiment points very decidedly to the operation of the only two conditions in which the lives of either class differed from the other, viz., night duty, and night-inhalation of barrack-room air.

These facts very conclusively bear out the probability that men in whom a recent change from existence in a medium but little below the normal warmth of the body, to one not as many degrees above freezing, necessitates an increased functional effort of heat-production equal to, as Professor Haughton

expresses it, so many foot-pounds, or to the strength expended in raising the weight of the body through a calculable distance, are rendered more than usually amenable to the hurtful influences of cold and damp, and also prove that in proportion to the length of time during which residence in a heated atmosphere lessened the demand on the heat-forming capabilities, so was the facility with which consumption was hereafter developed; likewise that the fluctuations of function necessary to compensate for marked variations of external temperature, as in the duties of cooks and night sentries, conduce to the same result, and that these conditions are morbidly efficacious in those in whom previous attacks of fever had degraded the vital elements of the spleen, and presumably, the adenoid tissue of the lungs.

The agency of overcrowding in producing phthisis has been placed by the labours of Dr. Parkes and others in the position of an accepted certainty, but nevertheless overcrowding, *per se*, in its worst form has never been credited with a power such as the records of the —th Regiment shows to have operated on those concerning whom they speak, and such as corresponds only with the effects of the most fatal trades.

Therefore, while, in contemplating the Indian inefficiency—6·6—and the English loss by invaliding and deaths—24·1 per 1000—amongst the same men grown older, every allowance is made for men in India, sleeping in open, airy, pervious bungalows, and at home in close, ill-ventilated, overcrowded rooms; still it cannot but be conceded that besides all this there must be a poisoned something intrinsic in the system to account for such a disproportionate and exorbitant propensity on the part of the returned men to destructive lung disease, and that this presumed degradation of the leucocytes, whether accomplished by the unwholesome air of close habitation, or by the malarious heat of an unnatural climate, allows, when the mechanical relations of the parts are changed in inflammation, of the escape of germinal atoms of such lessened viability, that by their quick decay and unfitness for absorption a substance is produced which causes unwonted cell proliferation in the minute lymphatic tissue.

I have thus attempted as briefly as possible—since, in the words of Pope,

> "Words are like leaves, and where they most abound,
> Much fruit of sense beneath is rarely found"—

to delineate "the nature and varieties of destructive lung disease as seen among soldiers," and to specify "the hygienic conditions under which they occur" in by far the largest proportion.

As a corrollary to the foregoing considerations it may be worth suggesting that to obviate as much as possible the protracted influence of constant changes of temperature on the same individuals, each man should be permitted to be a cook only for a limited period, and that then another should take up the duty, so that the risk would be curtailed and a larger number compelled to learn a useful occupation.

Also that the complete transition from India to England might be broken by allowing regiments, when being brought back from India, to conclude the tour of foreign service in the Mediterranean stations instead of, as at present, commencing a service in the Mediterranean, which is to be continued in India and transferred from thence to England.

APPENDIX No. VII.

TWO CASES OF ENDOCARDITIS WITH FIBROID VEGETATIONS AND EMBOLI.

By W. G. Don, M.D., Assistant Surgeon, Royal Engineers.

At the autopsies of soldiers in Aldershot, unsuspected endocardial lesions are frequently displayed in men who die from other diseases. Such lesions, in fact, are often as difficult to detect during life as they are generally insidious in their origin and progress. The two following cases may therefore prove interesting and instructive, as the lesions were fairly diagnosed during their fatal progress, while the pathological results were closely anticipated. The elaborate post-mortem examinations now made in Aldershot by Staff-Surgeon Dr. Becher, while fully displaying pathological results, at the same time severely test pathological diagnoses. The frequency of endocardial and aortic inflammation and degeneration among soldiers is well known; but may not this supposed special liability be, to a certain extent, more apparent than real? It can scarcely be doubted that, in civil life many deaths, which are returned under various diseases not verified by post-mortem examination, may really occur through endocardial lesions—direct or remote. In this way a good many of the civil deaths under the general terms, apoplexy and paralysis, might be returned more correctly in a pathological sense under endocarditis with resulting embolism. Again, in nearly all deaths among soldiers, diagnostic anticipations are reported, corrected, or confirmed by careful post-mortem examination of the bodies. Probably, were a similar test applied in civil practice, endocardial lesions of the kind under review would prove more common than supposed, and be often found when little expected. Apart from such considerations, however, there can be little question that diseases of the circulatory system are really unduly prevalent in the Army, whatever may be the causes assigned. It is remarkable, moreover, that the subjects of such diseases very often remain at duty up to the day and hour of sudden death. I refer chiefly to sudden deaths from aortic aneurism, with valvular degenerations, of which the number in Aldershot, especially among non-commissioned officers, is a subject of frequent and painful comment. Such only proves how insidiously endocardial lesions will often proceed to a fatal termination, without disabling from military duty, or even causing such personal inconvenience to the individual as would bring him under the observation of the medical officer.

I cannot here either pretend to explain or attempt to go into the special causes of endocardial disease among soldiers, but may glance at the three supposed general causes, whether among the military or civilians; there are, acute articular rheumatism, syphilis, and slow alcoholic poisoning, or what may be shortly termed, chronic alcoholism. The first I will not discuss, because neither from Army Medical statistics nor from my own experience can I gather that acute articular rheumatism is at all common among soldiers. Various chronic pains, fibro-muscular and osteal, are of course common enough, but not acute rheumatic fever. Syphilis, with all its train of miseries, is perhaps considerably more common in the Army than in civil life, owing to the necessary celibacy of the great majority of soldiers; and it probably determines valvular and aortic degeneration in not a few cases. But as regards the last supposed cause, chronic alcoholism, I feel strongly that it has much to do with endocardial disease, especially in old soldiers. An old soldier may have a leash of good-conduct rings, a clean defaulter's sheet, and even a blank

medical history sheet, and yet, for many years, have had alcohol circulating in his system almost every hour of the twenty-four. This is exactly the class of man who sometimes suddenly appears in hospital with an aortic aneurism, or sub-acute valvular degeneration, and it is often difficult to prove the fact of his quiet-going intemperance.

At the same time it would be very wrong to ascribe the relative frequency of endocardial disease among soldiers entirely to intemperance, whether of an acute or chronic kind, more especially when we consider the drinking habits of the class corresponding to them in civil life. If it be not less true than deplorable, that an advance of wages too often means, chiefly, increased indulgence in spirituous liquors, then it might fairly be argued, *a priori*, that the poorly paid soldier is of necessity a more sober man than the high waged artisan or miner.

The *modus operandi* of alcohol in inducing endocardial change is another and much deeper question. It is affirmed that the endocardium has a direct "elective affinity" for alcohol; but it is nevertheless probable that the effects of the alcohol in producing disease are more indirect than direct. The rationale of this supposed indirect action might be given as follows:—Chronic alcoholism tends to "cause an accumulation of imperfectly oxidized" and effete products in the blood, and it is clearly ascertained that the presence of such bodies, as in certain forms of gout and rheumatism, sooner or later causes changes in the nutrition of fibro-serous structures in general, and those of the heart and great vessels in particular.

In neither of the following cases could I trace the origin of the endocarditis to rheumatism, syphilis, or alcohol, although there was some suspicion of the latter. Both must, therefore, vaguely be attributed to general idiopathic causes, in the sum of which a leading factor was stated to be "cold."

In the first the lesion was *mitral*, and was not, if it could have been, detected until fully developed.

The second was *aortic*, and was at once made out on admission to hospital, in so far, as it is prudent to form a confident diagnosis of such cases on a primary examination.

Case 1.—Sapper R. S., aged 40, 5th Company Royal Engineers, 13 ½ years service, of which several spent in Bermuda, where he had suffered from yellow fever during the epidemic of 1864. No secondary syphilitic history; a tall, fair Scotchman, spare, but strongly built, somewhat broken down in appearance, although he had usually enjoyed good health. Had never suffered from acute or chronic articular rheumatism, habits moderately temperate, and no evidence of a recent debauch. During the Autumn Manœuvres of 1871 he was much exposed in wet ditches in connection with the water supply of the various encamping grounds, and he was of opinion that he then "caught cold." When the manœuvres terminated at the end of September, he came into hospital for four days, under "febricula," but as the attack was transient it was evidently considered unimportant, as there is no other record but the fact of admission. Viewed in the light of his after history, however, this simple short attack of febrile malaise was very probably coincident with the commencement of the endocardial inflammation. He was at duty until the 10th October 1871, when he again came to hospital complaining of the general symptoms of influenza, under which he was admitted, that affection being then, as it generally is in autumn, somewhat prevalent in camp. His symptoms were slight feverishness, a little frontal headache, cough, with a few bronchial râles over chest, muscular pains in limbs, but no articular rheumatism. He did not complain in the least of any cardiac uneasiness, and nothing abnormal was observed in connection with the heart's functions. Under treatment the pyrexial symptoms almost disappeared in a few days, leaving only persistent frontal headache, with considerable debility.

After this he suddenly complained of acute pain in the calf of right leg, which lasted for two days, but there was neither swelling nor tenderness of the part on pressure.

On the morning of the 17th he suddenly, and apparently purposely, got out of bed, and immediately fell down insensible, and paralysed on the right

side. I examined him very soon afterwards and found complete hemiplegia, with flaccidity of the muscles on the affected side; mouth twisted to the left, unable to protrude tongue; pupils natural; pulse 90, full and very soft; urine and fæces passed involuntarily. Sudden serous effusion into brain was at first suspected, and a blister ordered to nuchæ.

During that day, and the next, he lay in the same condition, but more or less sensible when roused. The true nature of the cerebral lesion was still not made out. On the 19th the pulse suddenly fell to 68, with stertorous breathing. I examined the chest closely, and found a faint bruit with the first heart sound, loudest at the apex, and not propagated along the great vessels. On the following day the pulse rose to 78, while the murmur was much more distinct at the apex, and also audible over both the mitral and aortic openings. The conclusions now arrived at were recorded in the case book, that the primary lesion was endocardial, and "it seems not improbable "that fibroid masses may be adherent to the valvular structures, and possible "that the paralysis may arise from detachment of a fibroid clot into the "cerebral circulation." The diagnosis of endocarditis vegetations on the mitral valve, and embolism of a cerebral vessel, was afterwards fully verified. The "temperature of the affected side remained unaltered."

On 21st he was drowsy and unconscious; pulse 72, soft and weak; "the "bruit with the first sound over apex is very distinct to-day, and rather "increased." The remark was also made, "I am more and more inclined to "ascribe the paralysis to embolism."

On 22nd the pulse was 120; the hearts action rapid and unequal, and the murmur loud.

On 23rd he became vaguely conscious when roused, but was steadily sinking.

On 24th he was described as in a "dying condition," with the pulse 150.

On 25th the pulse had fallen 10 beats, and the bruit was less audible. He now gradually sank, and died at 5·30 p.m. on 27th.

The following remarks were made in the abstract of the case forwarded, pending the post-mortem examination:—"Although this man never com-"plained of cardiac symptoms, I am of opinion that he suffered (from the first) "from sub-acute endocarditis with fibroid deposits on valvular structures. "Embolic obstruction of a cerebral vessel would account for the sudden "hemiplegia, and the subsequent history of the case points to gradual softening "of the cerebral ganglia, probably the corpus striatum, thalamus, or crus of "left side."

The post-mortem examination 40 hours after death disclosed the following: Hypostatic congestion of lungs; heart large; muscle structure healthy; the mitral valves presented recent inter-lamellary inflammation, with the usual thickening, and roughening where the endocardial surface was abraded. Attached to the upper surface of the valve was one fibroid clot of the size of a hazel nut, and several other vegetations considerably smaller. The endocardium around the mitral orifice was opaque. The aorta was healthy; no pericarditis. The cerebral membranes and sinuses were congested. At the base and left lateral aspect of the cerebrum there was a large yellowish discoloration, which in section proved to be extensive yellow softening of the brain matter; this resulted from plugging of the left middle cerebral artery by a fibroid clot from heart; from the point of obstruction the arterial branches were filled with dark firm coaguli. The basil ganglia were not seriously involved in the softening. There were emboli on the surface of the spleen; but no emboli or thrombi of the main arteries of the right leg, which had been the seat of the acute pain.

Inspector-General Lawson remarked to me, in connection with this case, that sub-acute pyrexial symptoms occurring in old soldiers, however apparently trivial, were very often associated with endocardial or pericardial lesions.

The next case was apparently sudden in its development, and was well marked on admission to hospital. Both the character of the murmur and the history of the case seemed to warrant a pretty confident diagnosis at once, and the immediate commencement of a definite line of treatment.

Professor Aitken lays down that "the detection of endocarditis *per se* is "one of the most difficult in practice"; and further, that "a murmur *per se*

"is no sufficient evidence of endocarditis." Nothing is probably more true, especially when there is no guiding specific pyrexia present, such as acute rheumatism. In this case there was only the character of the murmur, its supposed sudden development, and the general symptoms, with febrile disturbance, to guide diagnosis.

Case II.—Driver F. M., aged 30, unmarried, a signaller in C Troop, Royal Engineer Train; service eight years, had never been abroad, dark complexioned, spare and wiry, had been previously healthy, well conducted, and not known to be intemperate. Had suffered some years ago from primary, but no history of secondary syphilis; no evidence of a recent alcoholic debauch. During the Autumn Manœuvres of 1872, he was with the Southern Force, and his duties as a signaller (by means of flags and lights) were often very severe and exhausting, involving long wet rides, exposure on hill tops, &c. He said, however, he felt well enough both during and after the manœuvres. On the 9th November 1872 he came under treatment for spasmodic stricture of the urethra, but was discharged well on the 26th of that month.

On 3rd December 1872 he was again admitted into hospital under endocarditis, with the following history and symptoms:—Four days previous he thought he "caught cold," which developed a febrile malaise; tightness across chest, with slight pains, especially in the region of the heart, and at the margin of the left ribs.

His face was pale and anxious, with the knit brows so characteristic of cardiac distress. I found a murmur with the second sound of the heart, loudest at the base on the sternal side, and feebly propagated along the aorta. The vital condition of the heart itself seemed quite normal. The pulse was 90, jerky and unequal, that of the "imperfectly filled" artery. No gastric disturbance, and the lung functions apparently as yet unimpeded. The diagnosis arrived at was acute and recent endocarditis, of and about the aortic valves, with regurgitation. Were the valves already insufficient from fibroid deposits or vegetations? This was to me a practical question. Being as I am, firmly persuaded of the powers of mercury over the plastic inflammations of fibro-serous structures, it was determined to place him under its influence as soon as possible, with the view of arresting valvular disorganization. Calomel was therefore prescribed every third hour, and a blister applied over region of heart.

For the first four days the bruit, the pulse, and the general symptoms underwent no particular change. The mercury then began to show its physiological action on the gums, and from that time the murmur markedly lessened, and in two days more entirely disappeared. This occurred on the seventh day from admission, and the eleventh from the period of attack. The visible action of the mercury, and the disappearance of the murmur was plainly more than a coincidence without antecedent cause; such at least is an entirely reasonable deduction.

The heart's sounds, however, were left muffled and indistinct. The pulse, moreover, was still unsatisfactorily high, from 90 to 100, but it was fuller and steady in flow, indicating that the valves were acting better; the patient's general symptoms were also much relieved. But Stoke's dictum was not forgotten, that, "a complete cessation of a murmur may coincide with an "advance of the disease." The patient was now conjointly treated by Dr. Erskine, Surgeon, Royal Engineers, and myself; he was ordered a mixture of bromide and iodide of potassium with salines. The *status quo* was maintained until the thirteenth day of the disease, when another train of symptoms speedily developed. The pulse advanced from an average of 100 to 110, full and soft, with hurried breathing, and return of cardiac distress. A blister was re-applied, and saline diaphoretics only given. Next day bronchial breathing existed over chest anteriorly, and crepitation over both lungs posteriorly; but there was no return whatever of the cardiac murmur. For the succeeding four days he exhibited the usual signs and symptoms of a patient suffering from double pneumonia of a very asthenic type; with the exception that, although the cough was troublesome, there was no expectoration whatever, which, moreover, was the case from first to last. Stimulants and support had to be freely

given. The pulse was very soft and weak, ranging between 120 and 130, while the respirations were often 40 per minute. The axiliary temperature was no more than 96·2. The skin acted freely, but the perspirations were not acid.

On the nineteenth day—sixth of the pneumonia—the urine was found to contain a trace of albumen, with an abundance of chlorides; the reaction was acid, and the sp: gr: 1030. The crepitation posteriorly now became mixed with pleuritic friction sounds, but it was recorded, "I can find no trace of the "heart bruit."

On the twentieth day œdema appeared in the right arm, leg, and side of chest; but on the left side only slightly in the foot and ankle. Careful, but unsuccessful, examination was now made for obstruction by venous thrombosis; in order to account for the irregular and unsymmetrical œdema. The question also more prominently suggested itself, whether the pneumonia might not arise less from cardiac regurgitation than from emboli-cardiac through bronchial arteries, peripheral from venous thrombi? Before death the œdema became more general; he gradually sank, and died on the twenty-third day from the first complaint of the endocarditis, and the tenth from the setting in of the pneumonia.

The pathological appearances anticipated were:—"Recent evidences of "endocardial inflammation, probably with vegetations on aortic valves; "pneumonia, probably with embolic (?) obstruction; pleuritis; embolism of "the other organs."

The post-mortem examination, twelve hours after death, revealed: old and recent pleuritis of both lungs; more than two-thirds of each lung very dense, sinking in water, but readily breaking down under pressure; had a brownish indurated appearance, unlike the granular look of grey hepatization after ordinary acute pneumonia; no emboli in the pulmonary vessels, but clots (probably post-mortem) in both pulmonary artery and vein. The diameter of the aortic opening greatly diminished, with recent inflammatory action in the valves, and slight atheromatous degeneration about an inch above them. On each of the aortic valves were vegetations varying from the size of a pin-head to a large pea. The heart itself, and the other cardiac valves were healthy. No pericarditis. The liver much enlarged, and very fatty, but containing no emboli. The spleen congested, with one large and several small emboli in its substance. The kidneys healthy in appearance. The brain also healthy. The mucous membrane of the stomach much thickened and almost leathery. The small intestines congested in patches. No venous thrombi were discovered.

The state of the liver and stomach was suspiciously indicative of intemperance, yet, as I have before remarked, the man's official character was "sober and well conducted."

From these cases and several others I have lately seen, under the care of Surgeon Erskine, R.E., several practical deductions might be made. One of the first is, that where—in this climate at all events—sub-acute febrile or influenza symptoms become developed, and are persistent for several days in soldiers past middle life (and probably the majority of soldiers, pathologically speaking, are past that period shortly after thirty, or after a service of, say, fifteen years) disease of the endocardium and aorta should be narrowly looked for. All the more would this apply if the patient had ever suffered from secondary syphilis, or was known or suspected to have been a steady drinker for years.

It is also shown that an endocardial murmur may disappear during treatment, and yet the disease may advance, or at all events not recede, as in the second case detailed. Again, endocarditis with vegetations on the valves may go on without developing any bruit; such was the case in Sapper F. B., who died in the Royal Engineer Hospital at Aldershot in July 1872. His illness, which lasted six weeks, began with sub-acute pyrexial symptoms, followed by a little articular rheumatism in one of the wrists, and also slight pericarditis, but with no endocardial bruit. He finally died with symptoms closely resembling enteric fever with pneumonia. The post-mortem examination revealed endocarditis, with large fibroid vegetations on the aortic valves.

APPENDIX No. VIII.

TWO CASES OF PENETRATING GUNSHOT WOUNDS OF THE CHEST. RECOVERY.

By Surgeon-Major J. TULLOCH, M.D., 1st Battalion 11th Regiment.

AT Morar, Gwalior, on 29th November 1872, a gross act of insubordination was committed, which caused the injuries related in the following cases.

When the troops were assembling for early parade, a private of the 1st Battalion 11th Regiment loaded his rifle (a Snider) and fired at his Colour-Serjeant at a distance of two yards. The bullet entered the back, on right side, penetrated the chest, and escaped in front above the nipple; after traversing the air for a distance of 17 yards, it then entered the back of a private, passed through the left side of his chest and dropped on the ground seven yards further off, where it was picked up, flattened in shape, and deficient in weight 45 grains.

Case 1.—Colour-Serjeant E. W., age 27 years, height 70 inches, 9 years' service, 8 in India, of lenco-phlegmatic temperament—pale and flabby—in enjoyment of good health, and of temperate habits. At 5·20 A.M., 29th November 1872 was wounded by a rifle bullet which was fired at a distance of two yards, his uniform being charred by the discharge. The bullet entered behind close to middle of internal border of right scapula, and passing straight through the chest escaped 2½ inches above the right nipple, splintering the third rib in its exit. When brought to hospital his tunic was found saturated with blood, there was, however, but slight shock, and he stated that he did not fall when hit, and not until blood flowed down his chest did he become aware of his injury. The wound presented the following appearances:—The opening of entrance was circular, with clean cut edges, measuring one inch in diameter, from which blood in small quantity was escaping; the opening of exit was ovoid measuring 1½ inches in its longest diameter, with clean sharp edges, differing in this respect from what is usually found in such cases. There was considerable oozing from this opening and front of chest, in neighbourhood, was highly emphysematous; no foreign substance detected in track of wound, but a splinter of bone, evidently rib, was found in the clothes.

Patient on admission was placed in a cot on his back, with left side slightly raised, clothes cut away so that wound might be reached but not further undressed, cold cloths and ice were applied to the chest.

About noon there was threatening of collapse, pulse 144 feeble, some signs of internal hæmorrhage, stimulants administered.

Evening—Collapse passing off; pulse 124; breathing tolerably easy.

2nd Day.—Some clotted blood expectorated; blood oozing from wound; no further emphysema; pulse 96; respiration 19; temperature 98·6.

3rd Day.—Some small clots of blood expectorated in the night. Face flushed; pulse good, 124; respiration tolerably quiet, 20; temperature 99·5. Removed to clean bed and clothes changed. Lint dipped in carbolic oil (1 to 5) to wound, and poultice over it.

4th Day.—Passed a tolerable night; cough troublesome, and some more clots of blood expectorated. Ordered diaphoretic. Continue carbolic dressing and poultice to wound.

Evening.—Emphysema extending downwards over abdomen to thigh; scrotum so tense that it had to be punctured with needles.

5th Day.—Emphysema much the same as last evening; coughed a good deal in the night, but expectorated only a few minute clots of blood; pulse, respiration, and temperature satisfactory.

Evening.—Emphysema extending down to middle of left thigh, and great tension over entire chest and abdomen; scrotum again punctured.

10 P.M.—Extension of emphysema upwards to neck and face; one eye quite closed, and great discomfort from the general distension; the canula of hypodermic syringe introduced under skin of scrotum, and large quantity of air escaped; by pressing from above downwards the air in walls of chest and abdomen emptied out and much relief obtained. The chest strapped and bandaged. Carbolic oil and poultice to side retained by half waistcoat fitted closely.

6th Day.—Some friction sound and moist râles can be heard in the lung, after displacing the outside air by pressure with stethoscope, but the lung on the whole is acting well. The most distressing symptom is the emphysema which, however, has not increased since last evening. Pulse 102; respiration 18; temperature 100·5; bowels not been moved since admission; enema of oil administered.

7th Day.—No increase of emphysema, but there has been a good deal of dark-coloured hæmorrhage from the anterior opening, and he has coughed up a considerable quantity of blood. Bowels moved. Continue strapping, carbolic dressing and poultice.

Evening.—Some oozing of dark blood from front opening; right side of face and neck more emphysematous, and both arms are very crepitant. Pulse, respiration, and temperature satisfactory.

8th Day.—Tendency to bleeding from exit opening continues; nothing else noteworthy.

Evening.—Feels uneasy about shoulder and is somewhat restless and feverish.

9th Day.—Passed a bad night, and when coughing there have been occasional spurts of dark blood from front opening. Temperature has risen to 102·3; pulse 120; respiration quiet; tongue blanched with white fur. The track of the bullet in front is beginning to show signs of sloughing; some bleeding from back opening.

Evening.—6 and 10 P.M. Very hot and restless, has taken very little food. Pulse and temperature high, and respiration slightly embarrassed, but auscultation does not reveal any grave signs.

10th Day.—Better to-day. Bowels moved three times by aid of calomel purge, some healthy pus and dead cellular tissue showing in back; front opening discharging dark blood, which sometimes spurts out when he coughs. Respiratory murmur in both lungs very good, and only near the wound is there any crepitus or friction sound worth noting. Emphysema has decreased during last twenty-four hours.

11th Day.—Slept six hours by aid of a morphia draught, and feels better. Pulse, respiration, and temperature improved, being respectively 88, 17, and 100·7. Pulse soft; emphysema less; healthy discharge from posterior opening but very little from the front, except of dark blood, but there are further signs of sloughing. The anterior opening gapes and looks as if the bullet in escaping had passed somewhat downwards over the rib. Patient complains of appetite failing; tongue pale, dirty white on upper surface; no expectoration. Ordered citrate quinine and iron.

Evening.—Skin again hot, but no other change.

12th Day.—Feverish and restless; temperature 102; pulse 102. On removing poultice from back, large quantities of air escaped with hissing noise, discharge healthy, front opening sloughing. Patient says he is weak, and asks for beer, which is allowed, one pint in small quantities in the twenty-four hours. Breathing easy; no expectoration; emphysema as yesterday.

Evening.—Skin again hot, temperature 103·1; pulse 112, soft; respiration 19. As these exacerbations of fever are not accounted for by physical signs in chest, it is presumed they are dependent in some measure on climatic causes. Quinine is therefore administered.

13th Day.—Better this morning. Temperature 100·8; pulse 102; respiration 19. Air appears to escape more freely from front opening, and em-

physema is subsiding. Has coughed up a little rusty sputa, but there are slight signs of pneumonia.

Evening.—Again very hot and feverish as last night. Pulse 116, full; respiration 24; temperature 103·1. Thinks the beer has made him hot, but there are now signs of extension of the pleuro-pneumonia towards base of lung.

14*th Day.*—Cool this morning, and pulse and respiration quieter. Whole of back of lung involved in the pneumonia, which, however, does not appear to be very active. Patient has not slept well; cough and expectoration very moderate.

Evening.—Skin again very hot, temperature 103·3; pulse 120; respiration 22; exacerbation of fever attributed more to malaria than pneumonia; it comes on about 1 P.M.; tongue white. Ordered quinine, 10 grs., to morrow morning.

15*th Day.*—Temperature at 9 A.M. reduced to 99·3; pulse soft and compressible; complains of being weak. Pneumonic crepitus over whole of right lung; very slight cough, and expectoration trifling, but rusty and tenacious what there is.

Evening.—Temperature higher than it has been yet, 104·2, nearly five degrees higher than this morning. To have 20 grains quinine in divided doses before noon to-morrow, commencing at 6 A.M.

16*th Day.*—Temperature reduced to 98°, 6·2° lower than last evening. This goes to confirm the opinion that the high evening temperature is not entirely due to the pneumonia, but is probably in great measure of malarious origin. In either view the antipyretic action of quinine is very remarkable. Pneumonic crepitus as yesterday, but air is entering lung freely. Examined urine, which is very thick and muddy, sp: gr: 1025, alkaline. No albumen. Microscopically, shows enormous quantity of broken down matter; epithelial débris and crystals of triple phosphate.

Evening.—Not so hot as last evening. Temperature 102·6; pulse 110; respiration 21.

17*th Day.*—Passed a tolerable night; coughs a little; sputa scanty, rusty; physical signs as last reported; emphysema disappearing; wound discharging freely from both openings. Continue quinine as yesterday; poultice omitted; carbolic dressing only applied to wound; chest well supported with many-tailed bandage; patient placed on air bed.

Evening.—A little feverish, but doing well.

18*th Day.*—Wound, externally, looking healthy; pneumonic crepitus less distinct.

Evening.—Pulse 104; respiration 20; temperature 101·5.

19*th Day.*—In good spirits, and doing favourably.

Evening.—Slight fever, temperature 102·5; pulse 116; respiration 20. Says he coughed a good deal during the day.

20*th Day.*—Passed a good night, and feels easy. Examined urine and found it much the same as before, but with less débris, sp: gr: 1025, alkaline; no albumen.

Evening.—Pulse 108; respiration 18; temperature 101.

21*st Day.*—Wound granulating; pneumonia subsiding.

22*nd Day.*—Appears to be doing well.

Evening.—Pulse 100; respiration 16; temperature 100. Exacerbations of fever much milder, but tongue continues white.

23*rd Day.*—Had good night, and feels comfortable; front opening discharging profusely; pus thin and somewhat offensive; opening in back discharging moderately of healthy pus; slight emphysema remaining; lung acting well, notwithstanding the pneumonia continues; been coughing a good deal, but expectoration next to nothing.

25*th Day.*—Skin cool; respiration free; wound granulating and contracting.

26*th Day.*—There is comparative dulness of right lung, but difference is very slight.

Evening.—Pulse 108; respiration 16; temperature 100·8.

27*th Day*—Has coughed during the night, dulness of lung slightly increased, and there is the same crepitus; and now in vicinity of wound in back, a whistling sound with expiration.

28*th Day.*—Profuse discharge of watery pus from front of lung, where air escapes in considerable quantity. Very little discharge from opening in back, which is all but closed.

29*th Day.*—Dressed front opening only, the discharge from the other being so trifling.

30*th Day.*—Examined urine, acid; sp: gr: 1025; no albumen; débris almost disappeared.

32*nd Day.*—Appears to be doing well; pus from front opening thicker and healthier, respiration tolerably free all over right lung, where, however, there is still some dulness and crepitus.

33*rd Day.*—Wound contracting; from posterior opening air escapes in small quantity with the same whistling sound.

35*th Day.*—Has been going on favourably last two days.

37*th Day.*—Examined lung carefully; there is still dulness and crepitation. Heart's sounds are very audible all over right lung; breathing is quiet, but pulse somewhat quick; temperature sub-febrile; entrance opening almost closed; exit opening granulating.

38*th Day.*—Examined urine after 20 hours, much whitish deposit, alkaline: no albumen, sp: gr: 1025; contains much débris—bacteria and crystals of triple phosphate.

40*th Day.*—Entrance opening on back closed, but not firmly. There is considerable discharge of pus and escape of air from front opening; examined urine passed during night, sp: gr: 1025, acid; no albumen; much débris and some uric acid.

43*rd Day.*—On examining injured side there appeared to be some flattening of the ribs about mammay region. The opening of exit is closing slowly; rib united; breathing good, although not quite equal to other lung.

45*th Day.*—Pulse 92; respiration 16; temperature 99.

47*th Day.*—Slight dulness towards base of lung, but respiratory sounds generally healthy, and, although not so full and free as in the other lung, they are, except in immediate vicinity of the wound, where there is moist crepitus, unattended with any abnormal sounds. General health good.

48*th Day,* 15*th January,* 1873.—Transferred to hospital, 26th Cameronians, on departure of 1st Battalion 11th Regiment from Morar.

Abstract of Case from 16*th January to* 4*th April* 1873, *by Surgeon-Major F. M. Skues, M.B.,* 26*th Regiment.*

This man was left behind in the hospital, 26th Cameronians, on the departure of his regiment on the 16th January for Subathoo. Two wounds exist on anterior and posterior, the former only now communicating with the chest. In the upper part of the chest the respiration is easy, and there is no crepitation in the proximity of the wound; the lower part of the chest is dull on percussion and respiratory murmur indistinct, especially posteriorly. Has only slight cough, and no expectoration; appetite good.

Though he has no actual fever, the temperature increases a little towards evening. On this account he got ten grains of quinine twice daily up to the 31st January, when, as he complained of the noise in his ears, it was omitted; but, on the 4th February, as this had ceased and the temperature still rose a little towards evening, quinine was resumed in gr: v. doses daily. On 7th February posterior wound was quite closed, but air still escaped from the anterior one, although its size was much decreased. A pad was applied to it, and pressure kept up by a hernia truss hooked over the shoulder. On the 23rd February the wound had closed (a few days before wound closed a small spiculum of bone was removed), and the truss was left off, and all medicines, except the quinine, discontinued. On 28th February, 1st and 8th March, he spat up a little rusty mucous and had slight cough, which ceased after a few days' rest and suitable remedies. From 20th March all expectoration and cough ceased; the respiration was easy, and dulness over lower part was diminished; general health good.

On 4th April was discharged convalescent to proceed to Subathoo, to rejoin his regiment.

April 11th.—Serjeant W. presented himself at hospital this morning at Subathoo, having arrived from Morar the previous evening. He looks a little thin and pale, but seemingly in good health. On examining his lung there is found but very slight difference between it and the other, a difference indicated more by the heart's sounds being unnaturally audible than by any perceptible dulness. Behind, his wound is firmly closed with a depressed cicatrix, in front the cicatrix has a small scab in it, which he attributes to his having rubbed it when travelling.

He has been directed to come into hospital after he has settled his family in quarters, that the effects on his lung of the rarified atmosphere of the hills may be observed.

Case II.—Private P. K., 31 years of age, height 64 inches, of nervo-lymphatic temperament, 14 years' service, 12 in India, habits not always temperate, but hitherto has had fair health.

At 5·20 A.M., 29th November 1872, was wounded by same bullet as in first case. The missile entered behind, penetrated the left scapula two inches above inferior angle, and half an inch inside of external border, and passing somewhat obliquely downwards and inwards, through the chest, escaped in front at fourth intercostal space, fracturing fourth rib, an inch above and to right of left nipple. When struck he fell to the ground, and was immediately after carried to the hospital in a dhoolie. When seen, a few minutes after, his clothes were found saturated with blood; he appeared to be collapsed, his face pale and cold, and features pinched. He moaned from time to time, as if in great pain, but seemed aware of his position. There was no expectoration of blood.

The wound presented the following appearances: posteriorly, the opening was oval, 1½ inches in long diameter, with clean cut edges, from which blood was oozing in considerable quantity. Surrounding soft textures emphysematous. In track of the wound, at this point, several fragments of bone (at first mistaken for bullet) were found; being firmly attached they were left to come away with discharge. In front the opening was irregularly circular, one inch in diameter, with starred and jagged edges. (It will be observed that the measurements of openings were reversed in Serjeant W.'s case), from which blood was welling freely. Air in large quantity passed into and out of this opening, and the skin in neighbourhood gave emphysematous crackle.

Pulse weak and indistinct, numbering, as well as could be ascertained, 128 beats in a minute. On percussing the left breast, the area of dulness was found to be increased; on applying the stethoscope the respiratory sounds almost absent, and cardiac impulse nearly imperceptible. The heart's sounds were muffled, and passing into each other without any distinct pause, and with each movement was a splashing sound, as if from disturbed fluid.

Patient placed on a cot on his back, and brandy given. Clothes cut away to give access to the wound, but no further undressing, ice and cold cloths to chest.

1 P.M.—Blood has been oozing from wounds since morning, but now in less quantity; complains of pain in chest, especially when he coughs; breathing rapid, accompanied with moaning sound. Has not spat up any blood. Continue ice to chest and to have iced drinks.

9·30 P.M.—Better, breathing easier. Has taken some beef-tea and jelly.

2nd Day.—Had snatches of sleep during the night, and is easier. Anterior opening closed with carbolic paste, made of chalk, linseed oil and carbolic acid.

2 P.M.—Has coughed a good deal, and is very hot and feverish. Swallowing hurts him, and he cannot take beef-tea. Feels a sensation in the throat as if a clot of blood was stuck there, which he is unable to bring up. Pulse 140; respiration 36.

6·30 P.M.—Has been able to take a little nourishment. Pulse 124, stronger; respiration still rapid, 36; temperature 101·7. The carbolic paste has not hardened, and is removed, and lint steeped in carbolic oil (1 to 5), with poultice over it, substituted.

3rd Day.—Slept occasionally through the night, and is quieter this morning. Seems to take a more hopeful view of his case. Pulse improved in tone and diminished in frequency, 100; respiration less laboured, 25; temperature 101·5. Both sounds of the heart can be distinguished, but not clearly; auscultation of heart is, however, difficult, from loud sounds of oppressed breathing.

Evening.—Restless and uneasy, has spat up some blood during the day. Breathing with difficulty and apparent distress; respiration accomplished nearly altogether by right lung; pulse 124; respiration 29; temperature as in the morning.

4th Day.—Slept a little during the night, but is more feverish this morning. Intense dulness over left side of chest; emphysema less. Most profuse purulent discharge setting up from posterior opening. Respiration embarrassed and shallow, almost altogether confined to right lung. Removed to fresh bed, and wounds dressed as before with carbolic oil and poultice.

Evening.—Much the same way; breathing abdominal and oppressed. Pulse 128, feeble; respiration 32. Is rather low; ordered wine.

5th Day.—Had a good night, but seems weak, and his breathing laboured. Pulse 120; respiration 32: temperature 101. To have wine; carbolic dressing to wound, and poultice to left half of chest retained by half waistcoat with straps.

Evening.—No change.

6th Day.—Passed a good night, but is much in the same state; breathing extremely laboured; pulse weak, jerky, and irregular. Patient placed on air bed.

Evening.—Breathing and pulse quicker, former 33, latter 128; temperature 101; but generally he appears no worse. Has taken nourishment freely.

7th Day.—Passed a good night, and is easier; wound dressed every morning. Free suppuration in back, less in front. Pulse 118; respiration 28; temperature 100·5.

8th Day.—Slept well and continues in the same state. Profuse discharge from posterior opening. Has light cough, and spat up a little blood. Pulse 108; respiration 30; temperature 101. Continue carbolic dressing and poultice as before.

9th Day.—Condition favourable, constitutional disturbance decreasing. Pulse 96; respiration 23; temperature 99·3.

10th Day.—Had a good night and is improved in every respect. Three small pieces of bone, presumably portions of scapula, came away in slough, which, in large quantity, has been separating during last two days. The discharge of pus from back is also enormous.

11th Day.—Continues in satisfactory state. Pulse 86; respiration 19; temperature 99.

At noon, profuse bleeding to about 3½ lb. occurred from posterior opening in about three minutes; he became suddenly collapsed and all but pulseless, when the bleeding ceased. Brandy had to be administered before the circulation was revived, when the pulse numbered 140. After he became restored, cold cloths, and afterwards pounded ice, were applied to the chest. In the evening he had quite rallied, and his pulse, respiration and temperature were respectively 128, 20, and 99.

12th Day.—Slept in the night. Pulse 100; respiration 22; temperature 99·8. No recurrence of hæmorrhage. Dressings not changed, but ice continually applied to the left half of chest.

13th Day.—Had a good night, and is better in every way.

14th Day.—Passed a very restless night; wound dressed for the first time since recurrence of hæmorrhage on the 9th, and large clot came out of wound, but no further bleeding. On applying stethoscope to back of chest, a low vesicular murmur is heard over base and apex of lung. No crepitation or friction sound.

16th Day.—Dressing changed. Air entering pretty freely into back of lung, without any abnormal sound. All symptoms favourable.

17th Day.—Although air enters freely in back of lungs, and there is fair vesicular murmur, there is not the same healthy condition in front or at the side where rubbing and gurgling sounds are heard, but the latter appears to be independent of movements of the chest.

18*th Day.*—Going on favourably. Breathing tolerably free, although to some extent it is abdominal, and the 5th, 6th, and 7th ribs do not expand so freely on the left as on the right side.

20*th Day.*—Reports very favourably of himself, and is in good spirits; condition of chest same as last reported. Wound discharging healthy pus in moderate quantity. Pulse 92; respiration 18; temperature 97·5.

21*st Day.*—Wound looking healthy, no pain or uneasiness; breathing tolerably free, except in front of left lung towards base. Pulse 92, feeble and irregular, as it has always been since the injury. On examining urine it was found to be of sp: gr: 1013, acid; on boiling it became milky, but cleared on addition of nitric acid. Microscopically, it showed crystals of phosphate of lime and large quantity of granular matter, mostly amorphous, but same as if casts of the kidney.

22*nd Day.*—Says he feels well. Pulse 80; respiration 18; temperature 98·7. He is very thin. No cough.

23*rd Day.*—Healthy pus from both openings. Percussion over lung in front and at side gives clearer sound, behind it is still dull; but all over lung, although vesicular murmur is not full, there is considerable quantity of air admitted. Examined urine, acid, sp: gr: 1016; crystals as before, but very few casts and much less granular matter. No albumen.

24*th Day.*—Breathing with ease, but ribs on left side do not rise as on the right side, so that the motion of the whole chest appears to have a degree of obliquity from right to left, but there is no serious action going on. Some friction sound in front and dulness behind.

25*th Day.*—Going on favourably, discharge drying up.

27*th Day.*—Wounds are contracting and looking well. No abnormal sounds audible in lung to-day. No cough or expectoration.

28*th Day.*—Wound closing, both in front and behind, and lung apparently admitting more air. Pulse 88; respiration 16; temperature 98·5.

31*st Day.*—Examined lung stethoscopically. Air entering freely behind with good vesicular murmur, not so much so in front. Examined urine passed forty hours, and found it acid, sp: gr: 1016; no albumen, but traces of casts.

33*rd Day.*—Condition is very favourable; pulse 78, strong and regular. Is getting strong and looking well. Urine, sp: gr: 1020, acid; becomes milky on boiling, but clears with N·05. Casts entirely disappeared.

37*th Day.*—Some sanious discharge from back opening indicating diseased bone. Patient is remarkably well. Pulse, respiration, and temperature normal. Appetite good.

39*th Day.*—Breathing easy, but still slightly abdominal. Both openings covered with loose granulations, but sanious discharge from back continues.

45*th Day.*—Able to sit up in bed, and is taking on flesh. Continues to progress favourably without interruption, although he is still weak.

48*th Day*, 15*th January* 1873.—Transferred to the care of Dr. Skues, 26th Cameronians, on the departure of the 1st Battalion 11th Regiment from Morar.

The man recovered without any bad symptoms, so that Dr. Skues, on discharging him from hospital, had no continuation of the case worth recording, except that on 24th February, and 2nd, 8th, and 11th March, spiculæ of bone had come away from the back.

10*th April.*—Arrived at Subathoo to-day in excellent health; his lung acting well, and both openings quite closed, but there is a degree of mobility of the fractured rib, which indicates that the bone has not united, this is probably owing to its having been constantly disturbed by the pulsation of the heart.

Remarks on the above Cases.

These men were wounded under circumstances which permitted their receiving an amount of comfort and attention which, in no probability, could they have received if similarly injured on the battle-field. This, however, does not lessen the interest attached to their cases, as severe in character as most bullet wounds of the chest which have been recovered from.

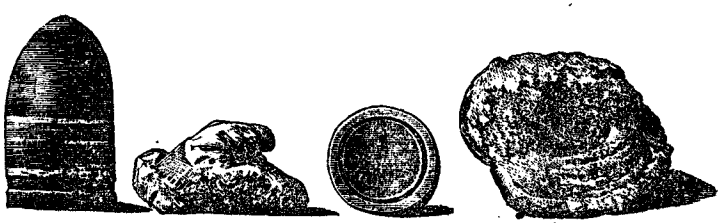
No active treatment was pursued; no bleeding; very little antimony; and although in Serjeant W.'s case calomel and James' powder were given for a

short time, it was more as an alterative, and to aid diaphoresis; the specific influence of mercury wes not induced. The two medicines trusted to throughout, in both cases, were ipecacuanha and opium. In Private K's. case, it may be said, no other internal remedies were used. The effect of the carbolic acid dressing to the wounds, there is reason to believe, was not limited to the external openings, as much vapour of the acid must have entered the lungs by the wounds during the act of respiration. The application of the carbolic paste to the anterior opening in Private K. was done with the view to excluding the air, in the hope that the opening might close, while all discharge would escape by the back. This might, or might not, have proved good treatment; but as the attempt proved abortive (from a mistake in mixing the paste which did not harden), nothing more need be said about it. Light warm poultices to the chest were very soothing to the wounded lungs.

If the heart in Private K. occupies the usual position, it is marvellous how it should have escaped, and it is indeed presumable, from the early physical signs, that the pericardium at least was injured. Whether this was the case or not, the heart now acts well, both sounds being clear and distinct. The action, however, is somewhat irritable and tumultuous; but that is said to have been the case before he was injured. The man himself states that when hit he was carrying his rifle at "the secure," a position which raises the shoulder, and was in the act of wheeling to the right, circumstances which may account, in some measure, for the course of the bullet. When the secondary hæmorrhage occurred in this man, fear was entertained that a large vessel at the root of the lung had given way, so large and so sudden was the flow of dark blood; but subsequent events showed this was not the case. It appears to be quite within the bounds of possibility that (as happened in this instance) so large a quantity of blood as 3½ lb. may escape from a slough of the lung in the course of three or four minutes.

Although both these men may be said to have made an excellent recovery, it is not likely either of them will ever be fit for regular military service. In the case of Serjeant W., his belts would cross the front cicatrix (his belts were rent by the bullet on leaving his chest), and pressure and constriction are not likely to be borne in that locality. Private K.'s scapula having been fractured and perforated, a degree of stiffness will probably remain to prevent his using his arms with freedom.

The wood-cut shows the Snider bullet, and the change of shape produced in its passage through the chest of the two men as described.



APPENDIX No. IX.

CASE OF FEIGNED DUMBNESS.

Extracted from Annual Medical Report (1867) of the Royal Artillery, Bangalore.

By Surgeon-Major T. C. O'Leary, M.B., Royal Horse Artillery.

J. Ware, a driver in the 14th Brigade of the Royal Artillery, was confined on the evening of the 28th September 1864, for absence, and making away with his kit. On the following morning he came to the hospital of his Battery, and communicated, by signs, to the Assistant-Surgeon in charge that he was suffering from headache and other consequences of excessive drinking. Among the remedies prescribed ice was ordered to the forehead, and a gunner of the Battery detailed to act as orderly over him. This man having, it appears, made free to use a portion of the ice, the patient remonstrated pretty strongly with him "for taking what was intended for himself," and these are the only words known to have escaped him from that date up to the middle of October 1867, a period of more than three years. When driver Ware had recovered from the effects of his debauch, attention was directed towards the loss of speech with which, he would make it appear, he had been suddenly afflicted, and the opinion of the most experienced medical men in the garrison was taken on the subject. The impression being general that the man was an impostor, experiments, calculated to test the truth of his written statements, were resorted to, but without the effect of inducing him to break silence. Among the rest an attempt was made to bring him under the influence of chloroform, and, from some cause or other, he was proof against the anæsthetic power of the agent. The patient had now been five weeks in hospital, and it was considered a waste of time to prolong the term of observation; a charge of malingering was, accordingly, submitted against him, and on this he was tried by Court-Martial, found guilty, and awarded an imprisonment of six months, with hard labour. At the completion of his punishment, through which he went in an orderly manner and in perfect silence, he was returned fit for all duties but that of sentry, a post requiring for its efficient performance the power and the will to challenge.

When the writer assumed charge of the Artillery at this station, in November 1865, the case of driver Ware was brought to his notice, and the man was examined. He was found to be 34 years of age, with a well-formed head, a massive lower jaw, and a countenance rather pleasing, and expressive of determination of character. He had the perfect use of all his faculties, but that of speech, and was of a frame unusually robust and well-proportioned. As the man performed all the duties allotted to him, with precision and intelligence, it was not considered prudent to submit him to further experiments, or to interfere with the arrangements already made in his behalf. From time to time he came to hospital, either for a dose of ordinary house-medicine, which he asked for on a slip of paper, or with a bruise or other trifling injury received in dealing with horses. On one occasion, however, he was severely kicked on the elbow, and a deep, lacerated wound was inflicted on this sensitive joint. Nevertheless, he was never heard to utter a word, and merely groaned when the horse struck him. On another his life was actually in peril by the near approach of a gun wheel to his head, as he lay on the ground after a fall from his horse, but he did not cry out or notify his alarm in a more demonstrative manner than by raising his arm to warn the drivers of his dangerous position. When the invaliding season of last year was at hand, a representation was made to the Principal Medical Officer upon the subject of this man's case, and it was decided to bring him forward for discharge upon the ground of danger possibly arising to himself or to others by reason of his persistent silence. Steps were, accordingly, about being taken towards effecting that object when a report was received that driver Ware had spoken one night to a man in the adjoining bed and had subsequently com-

municated to the Serjeant-Major of the Battery that he had regained the faculty of which he had been so long deprived. On being ordered to the hospital, he entered fully into the subject of his long silence, for which he was unable to assign any cause, and, there being now no obstacle to his acting as sentry, he was returned as fit for the performance of all duties. A rumour exists that this man expressed in the presence of others his determination to impose on the Medical Officer, and it has been proved beyond question that he remonstrated, by word of mouth, with an orderly soon after he had communicated, by signs, to the Assistant-Surgeon of his Battery that he had been struck dumb. Moreover, his intellect has been throughout unimpaired, he has had full power over all his limbs, and, unlike those suffering from aphasia, he made no attempt whatever at expressing his ideas.

Having these facts in view, the man may, it is believed, be set down as an impostor, but not of the common order, and as possessing a power of will rarely enjoyed. As the case, whether regarded psychologically or in a pathological light, according to the estimate taken of the circumstances narrated, appears to present some interest, apart from its military bearing, it has been considered worthy of special notice.

APPENDIX No. X.

CASE OF SUNSTROKE, TREATED SUCCESSFULLY BY THE HYPODERMIC INJECTION OF QUININE.

By Surgeon-Major T. C. O'Leary, M.B., Royal Horse Artillery.

A man of the D Brigade, Royal Horse Artillery, was, with others, unavoidably exposed, in shifting baggage at the break formed by the Kistna river, on the line between the Madras and Bombay Presidencies. He was young, healthy, and had not been drinking. The train was about to start, at 3 o'clock in the afternoon, from Raichare, when he staggered up to the carriage set apart for the sick, and asked for admission, saying "he was dying." The bell had rung, and no time was to be lost. The water chatties were filled, a lump of ice procured, and the two Medical Officers accompanying the Brigade entered the carriage with him. The cold douche was assiduously employed, ice was applied at the nape, and friction of the limbs kept up. Though the temperature of the surface was brought to its natural standard, the patient was making no rally, and the heart's action was rapidly failing. Stimulants could with much difficulty be administered, as the jaws were firmly closed, and complete insensibility was almost established; in short the case was becoming desperate.

Quinine had been recently recommended in cases of this nature and, as a syringe was at hand, it was determined to introduce the drug sub-cutaneously. The effect was closely watched, and after the first injection the pulse at the wrist was felt to flicker; this encouraged a further trial, and the result was so satisfactory that a third injection was accomplished. Within a few minutes the circulation was fully established, the man sat up, stared vacantly about, and recognized those standing near.

It is only necessary to add, that within half-an-hour from the time when the first injection took place the patient was partaking of mutton broth, and was partly feeding himself. He soon fell into so comfortable a sleep that the Medical Officers were at liberty to leave him, and on the arrival of the train, at 7 o'clock in the evening, at Goolburga, he was practically convalescent. On reaching Kirkee next morning he jumped out of the hospital carriage, and would have marched to barracks had he been permitted.

The jolting of the carriage did not permit a nice calculation to be made of the quantity of quinine introduced at each injection, but the apothecary was of opinion that five grains, in all, must have been passed under the skin. No ulceration took place at the points of entrance of the needle.

APPENDIX No. XI.

ON DENGUE.

Extracted from the Annual Report of the 2nd Battalion 10th Regiment for the year 1872.

By Surgeon-Major G. M. Slaughter.

STATION, RANGOON.

On referring to the table of diseases the first that appears is dengue, the number of admissions for which will be seen to far exceed that for any other disorder, and it therefore occupies in this respect the position assumed by malarial fevers during the previous year.

Dengue is reported to have existed in an epidemic form in Burmah forty years ago, and appears to be well known to the older inhabitants. On the present occasion there is good reason to believe that it was imported from Calcutta, as it prevailed there some time before it manifested itself here, and it was known that cases of it occurred on board the steamers plying between the two ports.

The disease first made its appearance in the regiment on the 15th of April, and prevailed till the middle of July, during which time officers, men, women, and children were alike affected. The total strength of the regiment present at Rangoon during the period of the epidemic was as follows: officers 23, men 650, women, 100, children 198; and of these 156 men, 30 women, and 39 children were actually admitted to hospital, besides which 21 officers were placed on the sick list. These figures, however, do not represent the actual number of individuals attacked, as many of the men who had the disease in a mild form did not report themselves sick. And with regard to the women and children, the number ill at the same time was so large that it was found necessary, on account of the limited accommodation in hospital, to treat them in their own quarters, and consequently very many cases occurred in addition to those above shown, which have not been entered in the return.

At the time that the disease existed in the regiment it prevailed most extensively in the town of Rangoon, no class of persons being exempted from attack, and domestic animals even were undoubtedly affected, as dogs and cats exhibited unmistakeable signs of rheumatism, accompanied with severe constitutional disorder.

The extremely contagious nature of the disease was manifested by the fact that when one member of a household contracted it every other member, including servants, became subsequently affected. Some few of the houses occupied by the officers remained fortunately free from the beginning to the end of the epidemic.

The most conclusive proof to my mind of the contagious nature of the disease was however afforded by the manner in which the married men and their families were attacked. The majority of them occupied three separate buildings, two of which were situated close together, while the other one was about 200 yards distant. These different buildings are divided into rooms by wooden partitions ten feet high, and have open ceilings, so that the communication between them may be considered almost uninterrupted, besides which, as the verandahs are common to all, the occupants must have constantly come in contact. Dengue commenced in these three buildings on different dates. Very shortly after it first manifested itself in the regiment a child living

PRIVATE JAMES FITZER AGED 19.
ADMITTED APRIL 22ND

Severe case
Well marked rash & rheumatic pains

PRIVATE JAMES BARRETT AGED 20.
ADMITTED APRIL 29TH

Severe case
Rash & rheumatism well marked

PRIVATE ISAAC DOUGLAS AGED 28.
ADMITTED MAY 2ND

Well marked case
Severe head-ache and rash.

PRIVATE ROBERT TEMPLEMAN, AGED 29.
ADMITTED MAY 5TH

Well marked case
Spots all over the body great head-ache

PTE JOHN KENNY AGED 33.
ADMITTED MAY 6TH

Well marked case
Pains & rash prevent

SERGT MATTHEW REISNER, AGED 34.
ADMITTED MAY 5TH

Severe case relapse on 6th day
Rash and pains well marked

PRIVATE MARTIN HYNES, AGED 35.
ADMITTED MAY 11TH

Well
Severe

PRIVATE THOMAS SAVERY AGED 26.
ADMITTED MAY 17TH

Distinct case
Pains & rheumatism

DRUM MAJOR DANSIC AGED 35.
ADMITTED MAY 20TH

Well marked case
Head ache rheumatism & rash

PTE ROBT MC NEILL AGED 35.
ADMITTED MAY 12TH

Distinctly marked case
Rheumatism & rash

BOY MC KENNY, AGED 13.
ADMITTED MAY 24TH

Distinct rash
Slight pains

BOY STEPHEN POWER, AGED 18.
ADMITTED MAY 25TH

Distinct rash
Slight pains

BOY GEORGE POWER AGED 9
ADMITTED MAY 25TH

Severe fever
Very distinct rash slight pains

CORPL JAMES MURRAY, AGED 26.
ADMITTED MAY 28TH

Distinct case
with rash & pains

PTE JOHN GALLAGHER AGED 31
ADMITTED JUNE 25TH

Severe pains
Well marked eruption

in the block nearest to the public road became affected, and in the course of about a week the disease extended from one end of the building to the other, hardly a single inhabitant escaping. During this time the families living in the other blocks remained perfectly healthy, and they continued so for the space of nearly a fortnight. In like manner the disease invaded and spread through a second block before it showed itself in the third. The two last buildings being those situated close together may explain the circumstance that the disorder extended to the third in a much shorter time than it took to reach the second. A few of the serjeants with their families living in separate buildings, some distance from the family quarters above mentioned, escaped entirely, as the children did not come into direct contact with those already attacked, in consequence of the closure of the regimental schools. The number of women and children who were ill about the same time in May was so large that they could not be taken into hospital, and were treated in their own quarters, as before mentioned.

The only fatal case was that of a delicate boy, aged 8 years, who became insensible and died after a few hours' illness.

The disease was found to attack people irrespective of age or sex, the only difference observable, being that the symptoms as a rule increased in severity and duration in proportion to the age of the individual, the rheumatic pains in particular being in older men especially severe and persistent.

I will now endeavour to give a short account of the symptoms of this hitherto slightly known disease, as observed in the numerous cases that have occurred in the regiment, and premise it by stating that the severity of the attacks varied very greatly, and that, while some individuals exhibited all the symptoms, others escaped with only a slight and temporary indisposition, which did not render them unable to perform their usual duties, and that, with the exception of rheumatic pains, none of the severe sequelæ following the other exanthematous fevers have been observed.

The first and one of the most marked characteristics of the disease was the suddeness of the attack, the acme of the febrile symptoms being attained on the first day. In many instances the men went to bed apparently in their usual health and awoke in the middle of the night with severe headache, high fever, and vomiting. In others, however, a general feeling of lassitude, and slight pains in the smaller joints, particularly of the hands, were noticed on the day preceding the full manifestation of the disorder. On the first day of seizure the symptoms in well marked cases were extreme prostration, severe pains in the loins, excessive headache, with a highly congested condition of the eyes, accompanied with nausea, and often severe and constant vomiting. In many cases the cerebral disturbance manifested itself by delirium, or drowsiness amounting almost to insensibility, and in more than one instance convulsions of an epileptic character occurred at this stage. These symptoms were associated with a dry condition of the skin and elevation of temperature to 104·5 degrees, which point was seldom exceeded. (The range of temperature was observed to possess a great degree of uniformity in nearly all the cases, as will be seen by an examination of the accompanying diagram, which includes patients of different ages as well as those attacked at different periods during the continuance of the epidemic.) The bowels were neither confined nor relaxed. Urine scanty and high colored, with copious deposits of lithates. Insomnia for the first 24 or 36 hours was not an unusual occurrence. On the second day the prostration continued, the red and congested state of the eyes began to subside, at the same time that the headache and pain in the back became mitigated, and as a rule the vomiting ceased, the pulse fell in frequency, and the skin acted very freely, the whole of the body being bedewed with moisture exhaling a peculiar, strong, and well marked odour resembling that of rotten straw. So distinct was this symptom that the disease could be recognised by it at a considerable distance from the patient. The eruption now made its appearance, and varied excessively in degree as well as in duration, being so fugitive in some instances that it could scarcely be detected at all, while in others the whole body became red, and remained in that state two or even three days. As a rule however a rash resembling roseola made its appearance on the chest and abdomen in patches of some size, and on the extremities in small roundish

blotches, which faded on pressure, and disappeared temporarily on exposure to the air. Occasionally the palms of the hands and soles of the feet were covered with it, and subsequent desquamation of the cuticle in large flakes took place. The colour of the rash varied from the lightest pink to a dark purplish crimson, the depth of colour bearing some proportion to the severity of the attack. In people with thin and delicate skins patches of vesicular eruption were not of infrequent occurrence. As the head symptoms subsided, rheumatic pains affecting all the joints became more manifest, the suffering from which for the first two or three days was often very great. The smaller joints of the hands were more or less affected in nearly every case, and slight swelling of the part affected was not an unusual accompaniment. These pains, though ordinarily confined to the joints, in frequent instances affected the fibrous structures, particularly the plantar and temporal fasciæ, and the fascia lata. The pain exactly resembled that of acute rheumatism and was greatly aggravated by any movement. The condition of the tongue at this stage of the disorder varied very considerably, being rarely dry, more frequently slightly coated of a whitish colour with distinct red papillæ, resembling the tongue of scarlatina. Occasionally the edges were bright red, shiny and sore, while in others, the entire organ presented this appearance, with superficial ulceration at the edge in addition. This inflamed condition of the tongue extended now and then to the fauces and pharynx, giving rise to great discomfort. Urine increased in quantity and became loaded with brick dust deposits. At this stage of the fever the memory was often very defective.

On the third day or about sixty hours after the first manifestation of the disease, a marked fall of temperature occurred. (From the observations recorded in more than one hundred cases, it was noted that the thermometer very rarely indicated more than 99 degrees, though it frequently fell below it). The congestion of the face and eyes disappeared, together with the headache and delirium, and generally the rash. The skin still acted very freely, and the peculiar odour remained. The pulse fell in frequency, and the patient expressed himself as feeling much better, though the rheumatic pains continued severe. There was often great debility, but the excessive prostration previously observed had now disappeared. The lithates in the urine were even more abundant, and the axillary, inguinal, and other lymphatic glands became slightly enlarged, and tender on pressure. The testes also in some instances become swollen and very painful.

On the fourth day marked improvement of nearly all the symptoms was observed, though the pains were still severe and the tongue occasionally red.

On the fifth day convalescence became more decided in many of the cases, though in some the joints continued stiff and painful on movement.

By the sixth day in the greater number of instances the graver symptoms had all subsided, leaving only debility, pains in the ankles and legs, and slight disorder of the memory; and on the seventh convalescence might generally be said to be fairly established.

Though the course of the disease above noted was the most ordinary one, exceptions were not very uncommon in which great and long continued debility associated with marked anæmia followed the acute symptoms. The rheumatic pains likewise were often most persistent, and long outlasted any constitutional disturbance; at the end of two and even three months the patients continued lame and were quite unable to undergo any great amount of physical exertion. The older patients almost invariably suffered in this respect more than younger men; in fact those under 25 recovered rapidly, while those above 35 were troubled with rheumatism often for months afterwards.

Only a passing allusion has been made to a very common symptom, that of loss of memory. For a week and sometimes a fortnight from the commencement of the disease the patients forgot names and words; facts became confused in their minds; and they were perfectly unable to write the shortest note correctly. In a few instances relapses took place on the sixth or seventh day, which occasionally exceeded in severity the original attack, though they were generally milder.

In the table which follows an attempt has been made to show concisely the most marked and prominent symptoms exhibited daily during an attack of ordinary severity.

TABULAR FORM showing the most prominent symptoms exhibited during the acute stage of a typical attack of Dengue.

First day.	Second day.	Third day.	Fourth day.	Fifth day.	Sixth day.	Seventh day.	Eighth day.
Temperatures of 104 to 105. Extreme prostration; flushed face; congested eyes: severe headache; pains in the loins; pains in the joints; vomiting, rapid pulse; dry skin. Delirium, insommia, and partial insensibility; scanty urine; moist tongue, with red papillæ.	Temperatures 101 to 103 4/10. Prostration; flushed face; congested eyes; severe headache: pain in the back increased; rheumatic pains in the limbs: rapid pulse; profuse sweating with peculiar odour; rash over the body and limbs; increased quantity of urine, with lithate deposit; partial loss of memory; sore coated tongue; offensive taste in the mouth.	Temperatures 98 to 99 2/10. Less debility; congestion of the face and eyes disappearing; headache } much pains in back } diminished. Pains in the joints and fasciæ continue; pulse softer, less frequent; profuse perspiration with odour; rash quite distinct; lymphatic glands swollen and tender; urine plentiful, with abundant deposits of lithates; memory defective. Tongue and throat still sore; offensive taste in the mouth.	Temperature 97 to 98 4/10. Great improvement; congestion of the face and eyes gone; headache } trifling pains in back } Pains in limbs are still severe; pulse natural; skin acting freely; appetite returning; rash generally faded; urine abundant, loaded with lithates; lymphatic glands tender and swollen; memory defective; tongue furred, sore at the edges; throat less sore.	Temperature normal. Still weak; convalescence more decided; pains in joints less severe. Pulse natural; skin moist; appetite fair; rash gone; urine abundant, with lithates; tenderness of glands less marked; memory returning.	Temperature normal; Relapses occasionally occur. All the graver symptoms subside, though local pains may remain.	Convalescent, though some debility remains and occasionally marked anæmia.	Complete recovery takes place.

Of the 157 men admitted into hospital for Dengue 143 were treated at Rangoon, the remainder at Poonamallee and elsewhere. The detachment at Port Blair Andamans escaped entirely, and the 110 men composing it have not been included in the strength previously given. The Officers suffered more severely than the men, for out of a strength of 23, 21 were laid up, and being, as a rule, older than the men, the individual attacks were far more severe. The universal character of the epidemic can also be estimated from the fact that fully nine tenths of the children in the regiment were affected at one time or another.

The average duration of the disease as affecting the men was found to be 5·59 days, and it exhibited itself in quite as severe a form towards the termination as at the commencement of the epidemic.

The treatment employed at the outset consisted of saline purgatives, diaphoretics and quinine. It was, however, found that a sulphate of zinc emetic at the very commencement of the attack afforded very marked relief. and appeared to shorten the duration of the febrile stage.

In many cases this was the only medicine given. In others diaphoretics followed by tonics were administered for a few days.

I am of opinion that the smaller the amount of medicine taken, with the exception of the emetic, and perhaps a mild purgative at the very beginning of the attack, the more rapidly the patients recovered. For the subsequent rheumatic pains, iodide of potassium, bicarbonate of potash, colchicum, opium, and quinine, together with varied local applications, were all tried, but without, as far as I could ascertain, producing any decided benefit.

APPENDIX No. XII.

REMARKABLE CASE OF HEART DISEASE. SEPTUM OVALE OPEN, AND INFERIOR VENA CAVA OPENING INTO THE LEFT AURICLE. NO CYANOSIS.

By ARTHUR E. T. LONGHURST, M.D., 4th Battalion 60th Rifles.

THE subject of this very singular case was a man of short stature,—height 5 feet 4 inches, frame well built, muscular development good.

At the age of 19 he enlisted into the 4th Battalion 60th Rifles, having been for seven years previously in the Royal Navy, and was in possession of the Baltic medal for service on board Her Majesty's frigate "Nile," during the Crimean war.

Embarked with his battalion for Canada in June 1861, and, without being habitually intemperate, he kept up his habits of sea life, taking stimulants pretty freely. His father died young; cause of death unknown; but he stated that his family were healthy, and his mother, who was with him constantly for some time before his death, was certainly a very healthy-looking old woman. He enjoyed good health in Canada, being always considered a strong muscular little man, ready for anything, and was for three summers employed as one of a boat's crew on the river St. Lawrence and Lake Ontario, in the service of the General Officer Commanding.

Had a mild attack of syphilis in 1868, not treated by mercury and not followed by secondaries; and returned to England with his battalion in good health in the summer of 1869, going through field days at Aldershot, and the autumn manœuvres for three seasons, without inconvenience. Was tapped for hydrocele in 1872, and in December of that year was in hospital for gout in the right foot, being at times dyspeptic, but never had acute rheumatism.

Came to hospital on the 16th October 1873, complaining of extreme weakness, amounting at times to syncope. He looked very ill, was deadly pale, respiration rapid and laboured, heart's action extremely quick and extended, with regurgitation into veins at base of neck, and the legs were œdematous.

Auscultation revealed pulmonic congestion, especially of the left side, and extensive valve disease of the heart, the nature of which could not be easily determined, owing to the very rapid action, 144 in a minute, with weak and irregular rythm. Having for some months past been employed as clerk in the battalion orderly-room, he had not been called upon to undergo much exertion or fatigue, but said that for the last few months he had been the subject of occasional dyspnœa, and that since arrival at Portland, in June, the dyspnœa had increased with increasing debility, making it difficult for him to ascend the hill to the citadel, a height of nearly 500 feet from the sea level. Was ordered a purgative, counter-irritation to back of left lung, diaphoretic, and digitalis, followed by relief of symptoms; and on the 18th, two days later, a systolic bruit was heard just below the nipple, carried downwards, and very extensive cardiac hypertrophy was diagnosed, dulness extending towards xyphoid cartilage and epigastrium, with giddiness and a confused, uncomfortable feeling in the head. Urine acid, depositing lithates, and slightly albuminous.

On the 24th the pulse was irregular, three rapid beats and then a pause; respirations 24, easy; no cough or expectoration, but some gouty pain in the knee.

25th, had a sudden attack of extreme dyspnœa, passing into a state resembling the clonic stage of an epileptic fit, but ending in coldness and exhaustion, and was considered due to pulmonary embolism. Ordered brandy and digitalis, under which the symptoms subsided to some extent; and on the 26th, the pulse intermitted less frequently.

On the 28th, the sounds of the heart were distinct and without bruit, impulse forcible and widely extended upwards and to the right. A fortnight later, the pulse was down to 100, the sounds of the heart were clear and without bruit, but intermitting, three rapid beats and then a pause, in length of two beats, the pulse at wrist not corresponding to the heart in number of beats. At the end of a month, the rythm was still irregular, pulse 132, respirations 32, the dropsy increasing; digitalis continued, and by the 6th December, had reduced the frequency of the pulse to 74, but the intermission continued about every third beat; the digitalis was omitted, and the pulse again rose from 100 to 144.

On the 15th December, the sounds of the heart were rather muffled and running into each other, but there was no bruit.

On the 20th, the heart sounds were quite regular, but there was a roughness with the diastole, and the pulse was 140.

From this date, the general symptoms advanced rapidly, especially the dropsy, necessitating paracentesis abdominis on the 4th January 1874, when two gallons of clear yellow serum were drawn off, with much temporary relief; but the abdomen soon refilled, with an accession of all the symptoms, but no marked change in the heart sounds, which continued regular, quick, and feeble, without bruit.

The operation of paracentesis was three times repeated with relief, but the patient grew weaker, and the case terminated fatally on the 19th February, four months from date of admission, the man's age being 36.

Autopsy 12 hours after death.

Body of a marked icteric hue, not at all bluish or venous in appearance; upper half wasted, lower half œdematous, abdomen much and uniformly distended, but without enlarged veins.

Thorax: muscular coverings wasted, cartilages of ribs ossified; right lung forced upwards, much congested and intimately attached to side by old adhesions; left lung in a similar condition, but atrophied and occupying only the mere apex of the thoracic cavity, the remainder of this space being occupied by an immensely hypertrophied heart, enlarged from above downwards, the shape of distended stomach, with a slight constriction across the left third, weighing, with adherent pericardium, attached vessels, and blood-clots, 2 lb. 9½ ozs., and clear of clots, 2 lb. 1½ oz.

The right auricle being laid open, was found extremely dilated, and full of dark jelly-like clots; the superior cava, opened into the appendix, also dilated; the foramen ovale only partially closed, there being three crescentic openings, the size of a pea, in the lower border of the septum, each having a raised and well-defined margin, giving to the septum, at this point, a cribriform appearance. The opening of the inferior cava was absent, the coronary vein was extremely enlarged, the eustachian and thebasian valves were well marked, and the diameter of the auriculo-ventricular opening was 1·67 inch, lappets of the valves were thickened, puckered, and imperfect.

Left auricle: cavity dilated, full of jelly-like clots, and having in addition to its ordinary apertures, the opening of the inferior vena cava, at a point posteriorly and inferiorly, and on the same plane, but posterior to the mitral orifice; the direction of this opening being clearly towards the cribriform septum ovale, whilst the pulmonary veins opened into the auricle superiorly, and their direction was towards the mitral orifice, the diameter of which was 1·45, and its valves were normal.

The right ventricle was full of the same jelly-like clots, but did not offer any point for special notice. Diameter of pulmonary artery 1·18.

The left ventricle formed the greater part of the entire weight of the heart, its apex being prolonged through a wide mouth into a large sacculated aneurism, the size of an ordinary orange, which was filled with layers of laminated fibrine, the external ones honeycombed and dense, the interior ones, lying next the cavity of the ventricle, being softer masses and without deter-

minate form and character; the ventricular walls were slightly thickened, but prolonged for a short distance into the aneurismal walls, the limiting membrane of the main dilatation being composed of the adherent and thickened pericardium, on the outer edge of which was a bony plate, the result of tissue degeneration.

The aorta was thin and flabby; no atheroma observed; diameter of aortic opening, 1·03; valves healthy; no fibrinous clots in the heart or great vessels.

Abdomen: liver rounded and contracted on its surface, capsule densely thickened; weight 2 lb. 7¾ ozs.; tissue presenting an excellent example of cirrhosis. Kidneys small and contracted; two cysts in the cortical substance of left, lined by a distinct membrane, and containing a serous-looking fluid; with a depressed, yellow, cheesy spot, found on section to extend inwards to the base of pyramid; its exact nature uncertain, but as though the remains of the wall of a cyst, such as noted on the surface. Some serum and flaky lymph in the cavity of the peritonæum; intestines distended, inflamed, and some of the intestinal convolutions glued together by recent lymph.

Remarks.—A consideration of the following points in this very remarkable, and apparently unique case, will, I think, be full of interest, and perhaps enable us the better to understand it.

1. The changes in the anatomy of the heart—
   (*a.*) Congenital.
   (*b.*) Structural, as the result of disease, or of both causes combined.
2. The changes in the adult circulation.
3. Perfect health and constitutional vigour up to 35 years of age.
4. The absence of cyanosis.
5. Absence of physical signs of congenital change.
6. Their comparative insignificance and variableness during the last few months of life whilst under observation.
7. The determining cause of the aneurism—The congenital changes, then, are as follows:—

   1. Superior vena cava opening into the appendix of the right auricle, which, together with the auricle itself, was extremely dilated.
   2. The inferior cava was absent from the right auricle.
   3. A cribriform condition of the septum ovale.
   4. The extremely large size of the coronary vein.
   5. The inferior cava opening into the left auricle, in the position and manner detailed.

Disease changes—

1. Adherent pericardium.
2. Dilatation of cavities of heart.
3. Thickened and puckered state of right auriculo-ventricular valve.
4. Thickening of left ventricle walls, which were prolonged for a short distance into—
5. A large aneurism of the ventricle.
6. Increase in weight of heart to 2 lb. 1½ oz.—whilst the changes from the ordinary course of the adult circulation, were as follows:—The blood of the lower half of the body brought by the inferior vena cava, instead of passing into the right auricle direct, is carried first into the left, thence probably through the cribriform septum ovale into the right auricle, establishing thus a double current in the left auricle, composed of—

   (*a.*) Venous blood, brought by the inferior cava for passage through the cribriform septum ovale into the right auricle, there to mingle with the stream from the superior cava, passing into the right ventricle, thence into the lungs; and
   (*b.*) Arterial blood, brought from the lungs by the pulmonary veins, for passage into the left ventricle, thence to the aorta.

A consideration, then, of the above two conditions—viz., the changes in the anatomy of the heart, and the changes in the course of the circulation, may help us, but for a full and clear explanation of the case we must revert to the conditions of fœtal life.

It is, I think, evident, that a communication between the two auricles,

through the septum ovale, was a necessary consequence of the inferior cava opening into the left, otherwise the two currents of venous and arterial blood must have mixed freely.

Again, the points of openings of the vessels and their directions, the alteration in the size of the chambers, &c., would materially influence the currents—*e.g.*, the site of opening of the inferior cava and its direction towards the cribriform septum, and the openings of the pulmonary veins in a direction towards the mitral orifice, might enable the blood currents in the left auricle to pass each other without very greatly commingling. There must, however, have been some slight admixture of venous and arterial blood in the left auricle, although apparently very small, from the absence of cyanosis; for granting that the blood currents from the inferior cava passed into the right auricle through the septum ovale, yet, on the contraction of the right auricle, some venous blood must have regurgitated through the opening into the left auricle, although the major part of it may have gone into the ventricle in the ordinary course.

I have said, however, that we must look to the conditions of fœtal life for a complete understanding of the case, and those conditions will, I think, render it pretty clear; for we know that during the very early development of the fœtal heart there is but one auricle, which subsequently becomes divided by the development of a septum, and that though for a time the superior vena cava does open direct into the left auricle, yet, with increasing growth or development, the septum rises up on the left side of the entrance of the vein, and thus causes it, together with the superior vena cava, to open into the right auricle.

We see, therefore, that the peculiarity in the present instance is really a remnant of very early fœtal life; yet that during that stage of fœtal development, the course of the blood was from the right to the left auricle, whilst in the case under consideration, in adult life, the course of the stream was reversed.

That such a condition should have continued into adult life, and that the subject should have enjoyed perfect health and strength, is not the less remarkable, any more than that the course of the circulation thus altered, should have flowed so evenly.

With regard to the conditions No. 3 and 4 noted, and referring to the health and constitutional vigour enjoyed by the subject, and the absence of cyanosis; it is, I believe, generally considered that the imperfect development which results in a direct communication between the two sides of the heart, gives rise either to palpitation, dyspnœa, and an enfeebled existence, or to very early death. Yet the subject in the present case was unusually strong and muscular, as stated, being known amongst his comrades as the little lion of the battalion; of free habit of life, and always ready for anything; and that he should have exhibited no sign of cyanosis is equally remarkable, unless the fact of the inferior cava opening into the left auricle, in a line with the apertures in the septum, and so directing the current of the blood, may be sufficient to explain its absence. Whilst we cannot here fail to be struck with the infinite power, wisdom, and skill, by which nature adapts herself to circumstances; or, in other words,—if even, we may venture to consider her as capable of error,—how easily, having once got into a difficulty, she rights herself; for surely, as above suggested, having put the inferior cava into the left auricle, she then left the septum ovale open, intending thereby, or in that way, to complete her form of creation and to fit the creature for the work of life.

A consideration of points 5 and 6, as to absence of physical sign of patent septum ovale, is also surprising, a loud superficial murmur being usually heard over the site of the communication; but in the various examinations through which this subject had passed from time to time, during a period of 15 years' service, nothing abnormal was ever detected; whilst its absence seems to prove that the passage of the blood through the cribriform septum into the right auricle was tolerably smooth and even, and the variableness and comparative insignificance of the physical signs of disease, whilst under observation during the last few months of life, were singular enough.

The physical signs, on admission into hospital, indicated a diseased condition of the tricuspid valves, allowing of regurgitation, whilst percussion declared

the hypertrophy, and both those conditions were realized in the *post-mortem* examination.

As disease progressed, the pulse became irregular, that at the wrist not corresponding to the beats of the heart, either in force or frequency, whilst the tricuspid bruit disappeared entirely; and the fits of dyspnœa, with symptoms apparently due to pulmonary embolism at times observed, seemed fairly attributable to the altered condition of the heart and its valves as the result of disease, quite irrespective of the congenital changes.

Lastly, as regards No. 7, the determining cause of the aneurism.

Was it a strain in rowing, or some other act of over-exertion, tissue degeneration in the muscular structure of the ventricle in a man of free habit of life, of a gouty diathesis, having a bony plate or spicula on the limiting wall of the aneurism? Or could it be at all of a congenital nature, originating partly in deficiency, more or less, of the muscular layers at the apex; or to changes in the force or direction of the blood currents, consequent on the patent foramen ovale and other congenital irregularities?

The microscopical examination of the structure of the left ventricle walls by Dr. Welch, Assistant Professor of Pathology at Netley, and who (in conjunction with my valued friend and brother medical officer in the battalion, Dr. Harman), has so kindly aided my attempt towards a clear report of this very interesting and unusual case, failed to detect syphilitic or other precise tissue degeneration; hence, Dr. Welch is disposed to attribute the aneurism to some congenital deficiency in the muscular layers at the apex of the ventricle, where they are always the thinnest; but I incline to the belief that, with any congenital defect there, adult life would not have been reached, or, if reached, the subject of such defect would not have been what he was in the present instance. Consequently, though the microscope did fail to detect tissue degeneration,—as there was an ossified state of the ribs, a bony plate on the pericardium, a diseased tricuspid valve, cirrhosis of liver and contracted and diseased kidneys, showing that tissue degeneration had for some time been going on in the ribs and viscera of a man who had been addicted to the free use of spirits for years, itself always so pregnant a source of tissue degeneration,—both Dr. Harman and myself are disposed to attribute the aneurism to a strain in rowing, or some other violent exertion, by which a weak point in the ventricle was established, and which eventually yielded to subsequent pressure and tissue degeneration; and that at most, the congenital condition of the ventricle and the anatomical changes in the heart, were only secondary causes in operation.

Verne Citadal, Portland, March 1874.

APPENDIX No. XIII.

ARMY MEDICAL SCHOOL, NETLEY.

The 25th Session, or Winter Session of 1872-3, was attended by 1 Surgeon-Major, 2 Surgeons, and 15 Assistant Surgeons of the Army Medical Service, whose names appear in List 'A,' which follows.

There were also present 15 Candidates for commissions in the Indian Medical Service, and 19 Candidates for the Naval Medical Service. There were no candidates for the Army Medical Service.

The Herbert Prize was gained by Mr. S. Brereton, of the Indian Service.

Six of the Assistant Surgeons went through their examination for promotion at the close of the Session.

List A.

Medical Officers who attended the Army Medical School at Netley during the Winter Session of 1872-3.

Name.	Rank.
Carey, Thos.	Surgeon-Major, 2 | 7th Foot.
Cattell, W.	Surgeon, 2 | 20th Foot.
Veale, H. R. L.	,, Staff.
Millar, W.	Assist.-Surgeon, Royal Artillery.
Creagh, W.	,, ,,
Hogg, F. R.	,, ,,
Ironside, W.	,, ,,
Maunsell, C. A.	,, ,,
Oliver, J. H.	,, ,,
Boulton, E. J.	,, ,,
Doig, A.	,, 79th Foot.
Turner, A.	,, 82nd Foot.
Macbeth, H. M.	,, Staff.
Allen, R. A.	,, ,,
Davis, J. N.	,, ,,
Beattie, J. F.	,, ,,
Bolster, T. G.	,, ,,
Reed, B.	,, 12th Foot.

LONDON EXAMINATION, AUGUST 1872.

Candidates for Commissions in the Indian and Naval Medical Services.

Anatomy and Physiology.

1. Describe the Hyoid Bone;—its form, position, and relations; ligamentous connexions; the muscles connected with it, and their exact points of origin and insertion; stating also the nerves by which they are respectively supplied, and their actions.

In what homological relation does the styloid process of the temporal bone stand to the os hyoides?

2. What are the structural elements of the nervous system? Describe them, and the varieties they present in different parts.

3. Describe the structure of the upper eyelid: integument, mucous membrane, cartilage, glands, muscles, &c.

4. By what simple experiment can it be shown that the walls of the blood vessels have an osmotic property?

Then give a general account of the process of *Osmosis*, and of the laws and conditions by which it is regulated or affected; including a definition of the nature and general characters of *Colloids* and *Crystalloids*; giving instances of each.

Surgery.

1. Describe the symptoms by which acute inflammation of the synovial membrane of the knee-joint may be diagnosed from inflammation, the result of scrofulous disease of the bones; and the treatment in each case.

2. A man is stabbed between the 5th and 6th ribs on the right side; what would be the evidence, physical and general—

1st. That the costal pleura had been perforated?

2nd. That the lung had been injured?

Describe the treatment of such a case.

3. Describe the local conditions of a phagedenic, or sloughing sore, on any part of the body; the general condition of a patient affected by such a sore; and the treatment to be pursued.

4. Explain what is meant by—

1st. Congenital hernia.

2nd. Infantile hernia.

3rd. Labial hernia.

5. By what symptoms may gangrene of the foot, the result of embolism, be diagnosed from senile gangrene? State in what respects the treatment would differ in each.

6. Describe the general and microscopical characters of "enchondroma" or "cartilaginous tumours," and in what structures they usually occur.

Medicine.

1. What are the diseases which may produce cavities in the lungs? Mention the chief diagnostic marks of these diseases, and state what stethoscopic signs may be given by cavities.

2. Two men were admitted into hospital with orthopnœa; in both men the jugular veins were greatly distended, but in one man there was œdema of the face, neck, and arms, but not of the trunk or legs; while in the other man the lower extremities were anasarcous, but the upper were free. In neither man was there albuminuria. Describe the diseases from which these men may have been suffering, and state what would be the other symptoms in each case.

3. Describe a case of cirrhosis of the liver, and give the morbid anatomy and treatment.

4. What are the chief entozoa which affect the human subject? How do they find entrance, and what is the best treatment for tape- and round-worms?

5. What are the symptoms of lead poisoning? Contrast the symptoms with other forms of palsy.

6. Give the diagnosis of anteversion of the womb; ulceration of the os uteri, and fibrous tumour near the fundus.

Natural History; Physics, &c.

Voluntary Examination.

Zoology.

1. Describe the principal characters of the different races of men, and give their general geographical distribution.

2. To what class of animals does the medicinal leech belong? where is it chiefly obtained from? describe the structure of its mouth and digestive system.

3. What are the characters of the dentition of rodents, ruminants, and carnivors respectively, and what is its relation to the food of each?

4. Enumerate the principal genera of mammals indigenous to the British Isles, referring each to its order.

5. Describe the structure, developement, and mode of reproduction of the guinea worm.

Botany.

6. What are the principal differences between exogens and endogens?

7. What is the nature of the fruit of the pine-apple, strawberry, mulberry, cherry, and apple?

8. Describe the development of the vegetable ovule, and define the terms anatropous, campylotropous, orthotropous, rhaphe, chalaza, micropyle.

9. From what plants are flax, hemp, and cotton obtained? Give in each case the part of the plant which yields the product, and say how you would distinguish them from one another.

10. What are the characters of the natural order Solanaceæ? what are the principal drugs yielded by the order? Give their properties and the part of the plant from which they are obtained.

Physics, &c.

11. Describe the nature of vinous and acetous fermentation.

12. What are the chemical and physical characters of starch, gum, and sugar, and what are their relations to each other in the animal and vegetable economy?

13. What are the principal ingredients of sea water? and what is the difference between hard and soft water? By what means can hard water be made soft?

14. Describe the structure of the common and forcing pump, and explain the nature and mode of action of an artesian well.

15. What is a volcano? Give a sketch of the principal volcanic regions of the earth.

Languages.

French and German.

Conversational examination in each, with exercises of dictation and translation.

NETLEY EXAMINATION, FEBRUARY 1873.

Held at the close of the 25th Session.

A. Written Examination.

I. Pathology.

1. Describe the origin and growth of the cysticercus, which becomes the common tape-worm in soldiers in India.

2. Describe the morbid condition of the lungs in a typical case of catarrhal or broncho-pneumonia; and give a summary of the lesions which its persistent or chronic existence may bring about in the texture of the lungs.

3. Private O'Hara, aged 32 years, was admitted into Netley Hospital from India on the 16th of May 1872. He died on 3rd December, and his body was examined on the 5th. He had 15 years service, of which 12 were passed in India where he had been a free liver as to alcohol. His height on enlistment was 5 feet 7 inches,—his weight 10 stone. At his death his stature was 5 feet 9 inches,—his weight 7 stone 5lbs. His ailments commenced in India in 1861, with gonorrhœa, which continued for five months—a bubo forming in the left

groin. He subsequently contracted syphilis and suffered from dysentery and bronchitis. In 1869 he suffered severely from hæmorrhoids, and, while in hospital in India, was seized with retention of urine—relieved by a No. 6 catheter, followed by copious hæmorrhage. A perineal abcess followed in 10 days, eventually leaving a urinary fistula. Another abcess formed in June 1869, also resulting in a (second) fistula. In March 1871 a third abcess formed, and a fistula followed in the ischio-rectal fossa, eventually resulting in a recto-urethral communication. In April 1872 he was invalided, and was 24 days on shipboard. The fistulæ were slit up. Abcesses subsequently formed in the left testicle and also above Poupart's ligament on the same side. Acute cystitis followed; but, from all these conditions he convalesced; until August 14th, 1872, when a second attack of cystitis ensued with evidence of inflammation of the liver. Numerous phosphatic calculi were passed per urethram, with evidence of renal complication. On November 23rd the secretion of urine had all but ceased. On the 26th there was so much improvement that 8 ounces of urine were passed in 24 hours; but on the 29th he again relapsed with pyrexia, delirium and coma continuing till death 7 days afterwards; and attended for a few days with jaundice.

(1.) At what age did this man enter the service? how much did he increase in stature after that age? and how much had he lost in weight at the time of his death?

(2.) What was noteworthy as regards the specific weight of the brain? and to what morbid condition might this peculiarity be attributed?

(3.) Describe the morbid conditions of the liver, kidneys, bladder, urethra and testicles.

(4.) Give a pathological commentary on the whole case:

(*a.*) As to the probable origin and sequence of events in the history of the case, connecting the lesions pathologically.

(*b.*) As to the probable immediate cause of death.

II. Military Hygiene.

1. In what ways may drinking water become contaminated? What changes occur in animal matter such as excreta which pass into water? What evidence connects such animal matters in water with any special diseases? What are the best plans of purifying water?

2. What is the standard of purity of the air of inhabited rooms? On what grounds is this standard arrived at, and what amount of fresh air must be supplied per head per hour in order to ensure it?

3. What are supposed to be the effects of a tropical climate on the native of the temperate zone?

4. What are the diseases which chiefly prove fatal to European soldiers in India? State what are the best known facts with regard to the prevention of cholera, enteric fever, dysentery and hepatitis in India.

III. Military Surgery.

1. Describe the characters of the several kinds of wounds and injuries of the soft parts of the body which may be inflicted by fragments of shell.

Give an account in detail of the treatment you would pursue in a case of severe laceration of the flesh on the outer aspect of the thigh caused by a heavy shell fragment.

2. You are aware that Professor Hannover, of Copenhagen, has published a condemnation of the practice of resection of joints in field hospitals, and that he has recommended amputation instead. Give an account of the grounds on which his condemnation of this surgical operation has been based, and mention any argument that may be urged in favour of an opposite conclusion.

If you agree in thinking resection a proper surgical proceeding for the treatment of any joint injuries in field practice, describe the cases which you consider to be suitable for the operation, and name the particular conditions of

injury, and any circumstances which would lead you to consider amputation preferable. Use injuries of the shoulder and elbow joints as illustrations of your remarks.

3. Explain the nature of the refractive conditions of the eye designated by the terms emmetropia, myopia and hypermetropia.

Describe the manner in which their presence may be severally detected, and the means of correcting the myopic and hypermetropic conditions when they are found to exist.

Give examples of correction as illustrations.

IV. Military Medicine.

1. Give as complete a description as you can of the various ways in which cholera can be propagated in India, indicating those which appear to be most efficient.

Describe a case of malignant cholera, giving the symptoms in the order in which they occur, with the temperature of the body internal and external, and the condition of the blood, stools and urine.

What are the signs of reaction? what its dangers? How does Dr. George Johnson explain the phenomena of the stage of collapse? What can be reasonably urged against this theory? What, in the present state of knowledge, appears to be the most rational treatment,—

(*a.*) In the premonitory stage;
(*b.*) When the disease is established;
(*c.*) During reaction.

2. Describe a case of quotidian fever, its cause, symptoms and lesions, with the temperature before, during and after the fit, and the condition of the urine in the various stages.

Give the treatment in the various stages, and the different ways in which quinine may be given. Name other febrifuges, and give their therapeutic value.

3. Give the causes, symptoms, and treatment of acute congestion of the liver.

B. Practical Examination.

Pathology.

(*Three hours allowed.*)

1. Examine the portions of tissue placed in the dishes. State of what organ each is a part, and describe the morbid condition which each shows.

2. In the preparations numbered 1, 2, 3 and 4, define anatomically what parts are shown in each, and the lesion or lesions present.

3. Determine the magnifying power of any one of the microscopes, and append the scale used.

4. Name the objects seen in the fluid contained in the test tubes, examined under the highest power.

5. Name each of the preparations placed under the microscopes on the table.

Military Hygiene.

(*Three hours allowed.*)

1. Examine the sample of water before you—as much as can be done in the time.

2. Examine the contents of the packet before you chemically and microscopically.

Military Medicine.

(*One hour allowed.*)

Examine the case of—

Write a commentary upon the case.

Analyse:—

(1.) The probable pathological conditions existing at the onset of the disease in January 1870;
(2.) Those existing six months later;
(3.) The appearences you would expect to find at the post mortem examination.

MILITARY SURGERY.

(*One hour allowed.*)

Examine preparation No. , as far as you can without handling it.

State what it is; the nature of the injury the bone has sustained, the probable symptoms which followed the injury, and the treatment you would adopt if a similar injury occurred in a case under your care.

THE EXAMINATION OF ASSISTANT-SURGEONS FOR PROMOTION, held at the close of the 25th Session, was the same as the Netley Examination for Candidates which has been detailed above, with the following additional questions, viz. :—

4. A case of Axillary Aneurism is placed under your care, and you determine to place a ligature on the subclavian artery in the third part of its course as the mode of treatment.

Describe the Surgical operation.

(*a.*) Commence by stating the position in which you place the patient, the arm on the affected side, as well as the part which you intend to incise, and give your reasons for selecting the positions adopted.

(*b.*) Give an account of the several stages of the surgical proceedings subsequently followed, and, in doing so, mention carefully each anatomical structure successively interfered with.

(*c.*) Explain the special difficulties which have occasionally been met with, and are liable again to be met with, in performing the operation.

(*d.*) Finally name the mistakes which may be made in its performance unless particular care is taken to avoid them.

The 26th Session of the Army Medical School, held during the summer of 1873, was attended by 5 Surgeons-Major, 13 Surgeons of the Army Medical Service, by 1 Surgeon-Major, 2 Surgeons and 16 Candidates of the Indian Service; and by 6 Staff Surgeons and 14 Candidates of the Naval Medical Service. There were no Candidates for the Army Medical Service.

The Herbert Prize was gained by Mr. D. Wilkie, Indian Medical Service.

Eight of the Surgeons of the Army Medical Service went through the examination at the close of the Session. The remainder had passed the examination previously and received their promotion while at Netley.

LIST No. B.

Medical Officers who attended the Army Medical School at Netley during the Summer Session of 1873.

Names.	Rank.
Smith, D. S.	Surgeon-Major (A.M.D.)
Bleckley, T. M., M.D. ..	,, ,,
Hutton, G. A.	,, ,,
Reid, B.	,, ,,
Wade, F. W.	,, ,,
Carter, H. V.	,, (Bombay Army.)
Comyn, J. S.	Surgeon (A.M.D.)
Ffolliot, W.	,, ,,
Kerans, W. R.	,, ,,
Ray, S. R.	,, ,,
Howard, F., M.D. ..	,, ,,
Robinson, J.	,, ,,

Names.	Rank.
Ramsbotham, W. B. ..	Surgeon (A.M.D.)
Kynsey, W. R.	„ „
Jones, M. G.	„ „
Macaw, K.	„ „
Page, W. J.	„ „
Boyd, W. C.	„ „
Fleming, J.	„ „
Law, J.	„ (Madras Army.)
Neil, A.	„ (Bengal Army.)

LONDON EXAMINATION, FEBRUARY 1873.

Candidates for Commissions in the Indian and Naval Medical Services.

Anatomy and Physiology.

1. Describe the brachial plexus, giving its anatomical relations, and stating the parts necessarily removed in order to expose it throughout its whole extent; then give the nerves which constitute it, and the mode in which they are arranged.

2. Describe the course, relations, and origin of the nerves respectively supplying the following muscles, stating also the point at which they enter the muscle :—*Obturator internus*; tensor vaginæ femoris; popliteus; anconeus; and sterno mastoid.

3. Enumerate the various excretions, and give the principal constituents of each, and their mean amount in the healthy adult; state also the source whence each of these constituents is derived.

4. Describe the minute structure of the retina in man.

Surgery.

1. Describe the symptoms by which an "impacted fracture" of the neck of the thigh bone may be distinquished from one within the capsule without impaction, the treatment in each injury, and their usual results.

2. Describe the structure and general characteristics of "epithelioma"; in what tissues and situations it usually occurs; and in what respects it occasionally differs from other forms of cancer in its results after treatment

3. Enumerate the symptoms by which an irreducible inguinal hernia (not strangulated) may be distinguished from either a tumour of the testicle, hæmatocele, or hydrocele. What treatment should be recommended to a patient, the subject of an irreducible hernia?

4. Describe the symptoms of gonorrhœal ophthalmia, the treatment to be pursued, and the usual results of an attack.

5. What are the pathological conditions usually observed after death in a man who has long suffered from severe stricture of the urethra?

6. Describe the symptoms of ruptured intestine, the result of a blow on the abdomen; and the treatment to be adopted in such a suspected injury.

Medicine.

1. A man aged 49 came into hospital with considerable anasarca and some ascites. He had been a hard drinker, and had had rheumatic fever at 23 years of age. What might be the causes of such a condition, and how would you proceed to examine the case in order to arrive at a diagnosis?

2. Describe fully a case of enteric fever, and contrast it with those diseases supposed to resemble it.

3. What are the symptoms and physical signs of fatty heart?

4. What are the chief structural changes in the stomach? Give the causes of hæmatemesis, and the treatment.

5. How would you diagnose and treat the following conditions occurring in pregnancy :—Placenta prævia; death of the child after the seventh month?

6. Give the composition of opium, its pharmacopœial preparations and their doses, the symptoms of poisoning, and the general indications for the employment of opium in medical treatment.

Natural History; Physics, &c.

Voluntary Examination.

Zoology

1. Describe the principal modifications of the vertebral column in the class vertebrata.
2. To what class and order does the genus aphis belong? Describe the nature of the productive process in the genus.
3. Describe the nature of the respiratory organs of batrachians in the several stages of their development.
4. How is the process of fecundation affected in fishes and insects?
5. Define the terms species, genus, organ, function, habit, instinct.

Botany.

6. Give the essential characters of the natural order coniferæ, and a brief sketch of the distribution of the principal genera.
7. What are the chief kinds of cell formation?
8. Define the terms monocotyledonous, dicotyledonous, exogen, endogen, thalamifloræ, corollifloræ; and name one or more British plants as an example of each.
9. Describe the vegetative and reproductive organs of ferns.
10. Explain the terms corm, rhizome, tuber, bulb, root, and illustrate each by drugs in common use.

Physics, &c.

11. Explain the principles on which the mercurial barometer is constructed, and the uses to which it is applied.
12. Under what forms is carbon found in nature, pure or in combination? Give the physical characters of each.
13. Give an account of the principal oceanic currents, and state in what manner and to what extent they influence the climate of the great continents.
14. Explain what is meant by polarized light, and state how it can be employed as an aid to recognize or distinguish animal and vegetable substances.
15. What is the composition, and what are the phyical characters of water? How is it affected by changes of temperature?

Languages.

French and German.

Conversational examinations in each with exercises of dictation and translation.

NETLEY EXAMINATION, AUGUST 1873.

Held at the close of the 26th Session.

A. Written Examination.

I. Military Hygiene.

1. What are the principal causes of vitiation of air, and what diseases are supposed to be connected with such vitiation?
2. How are the following diseases supposed to spread, and what are the best means of preventing the spread,—Enteric fever; typhus; cholera; dysentery; yellow fever.
3. What are the chief points connected with the climate of India which appear to be of importance as influencing Europeans?
4. What are the death-rates and causes of death in Europeans serving in India; and to what causes is the diminution in the mortality of late years owing?

II. Pathology.

1. Describe the kind of injury and condition of wound apt to be followed by pyæmia. State the probable source and nature of the poison of pyæmia, and the post mortem appearances seen in a characteristic case. Give an account of the recent experiments of Drs. Sanderson and Klein relative to this disease. What do you understand by "Septicæmia"?

2. Explain the term "Microzymes." Name and give what account you can of the forms that have been so called, and state what pathological significance you attach to each or any of them.

3. The body of Private W. Dorey, 70th Regiment, age 21, with 2 $\frac{3}{12}$ years of service, was examined during the Session. He was a well developed recruit on enlistment, but, six months after he arrived in India, he suffered from dyspepsia and debility, and was sent during the summer to Murree, where he contracted a persistent diarrhœa. On returning to his regiment in the plains, he was suffering from hectic and chest symptoms referred to early phthisis. He was invalided after 18 months' stay in India. During the voyage home, the chest lesion remained latent, but obstruction of the right iliac veins occurred and continued as a permanent feature in the case after arrival at Netley, attended with constant diarrhœa and progressive emaciation. When coughing on the 26th of May he suddenly felt severe pain over the abdomen; acute peritonitis set in, and terminated life in 26 hours. Habits were temperate and there was no history of hereditary disease.

At the post-mortem examination, lesions were general in the lungs, peritoneal cavity, intestines, liver, spleen, kidneys, right supra-renal capsules and right iliac veins. In the solid viscera, the lesions mainly consisted of structural nodules.

Enter fully into details regarding the pathology of this case under the following headings:—

(*a.*) The cause of the peritonitis immediately inducing death, and the local conditions which led up to it;

(*b.*) The morbid appearances of the iliac and femoral veins;

(*c.*) The nature of the nodules and deposits seen in the viscera—especially kidneys and spleen—the usual microscopic features of each, and the points which differentiate the one from the other in the deadhouse;

(*d.*) Connect the pathological sequence of events in this case, as based on the medical history, and the morbid anatomy details of the post mortem examination.

III. Military Surgery.

1. Describe generally the antiseptic treatment of wounds as practised by Professor Lister. Explain the principles on which the treatment is conducted, and show how far you consider it capable of being applied to the treatment of men wounded on active service in the field under the ordinary circumstances of such service.

Illustrate your reply by selecting some wounds likely to occur in the field, and tracing out their treatment from the place of their occurence on a field of action to the fixed hospitals in which the final stages of the treatment are conducted.

2.—

(*a.*) Explain the principles on which Snellen's test types are employed for determining that a man possesses normal acuteness of vision.

(*b.*) How may an expression of different degrees of visual acuteness be obtained from the use of Snellen's types? Give an example in illustration of your reply.

(*c.*) What degree of visual power does the fact of a recruit being able to see clearly the Regulation test dots at 10 feet distance prove him to possess? and, whatever may be the conclusion you arrive at, give your reasons for it.

3. Describe the leading varieties of wounds of the bladder caused by rifle shot, the principal complications with which they are liable to be accompanied, and explain your views as to their proper treatment.

IV. Military Medicine.

1. What are the diseases of the circulatory system commonly seen among soldiers and seamen? Describe them briefly, giving the causes which appear most active in producing them, and the most rational treatment, preventive and remedial.

2. What is the sense in which the term "pulmonary phthisis" is used in modern medicine? What are the causes which appear to favour the prevalence of this disease in the Army and Navy, and what are the remedial measures most likely in your opinion, to diminish mortality and invaliding from this disease in its various forms?

3. Describe the various forms of epilepsy, with the diagnosis between true and feigned attacks.

Give the most common and easily recognized causes of the disease, in the forms which are within the domain of curative medicine, with the most rational treatment in each.

B. Practical Examination.

Pathology.

1. Examine the portions of tissue placed in the dishes. State of what organ each is a part, and describe the morbid condition which each shows.

2. In the preparations numbered 1, 2, 3 and 4, define anatomically what parts are shown in each, and the lesion or lesions present.

3. Determine the magnifying power of any one of the microscopes; give the number of the microscope used, and a drawing of the scale by the Camera lucida.

4. Name the objects seen in the fluid contained in the test tubes, examined under the highest power.

5. Name each of the preparations placed under the microscopes on the table.

Military Hygiene.

(*Three hours allowed.*)

1. Examine the samples of water, milk, and beer before you—as much as can be done in the time.

Military Medicine.

(*One hour allowed.*)

Give the diagnosis of case,—
State the nature and anatomical position of the lesion.
What treatment would you have adopted?
What would you expect to find at the post mortem examination?

Military Surgery.

(*One hour allowed.*)

Examine preparation No. as far as you can, without handling it

State what it is; the nature of the injury the bone has sustained, the probable symptoms which followed the injury, and the treatment you would adopt, if a similar injury occurred in a case under your care.

The Examinations of Surgeons, Army Medical Service, for promotion, held at the close of the 26th Session was the same as the Netley Examination for Candidates which has been detailed above, with the following additional question, viz:—

4. Describe the operation of placing a ligature on the axillary artery in the first part of its course, below the clavicle; particularising:—

(*a.*) The direction and extent of the first incision;
(*b.*) The anatomical structures exposed in the second stage of the operation;
(*c.*) The relative positions of the artery, axillary vein, and brachial plexus when the vessel is finally reached, with the mode of passing the ligature; and,
(*d.*) The particular dangers to be guarded against in each of the foregoing steps.

EXAMINATION OF ASSISTANT-SURGEONS FOR PROMOTION.

(Questions sent to Stations.)

January 1872.

Military Medicine.

Give a brief but clear description of the following skin diseases, their etiology, symptoms and course, diagnosis and treatment:—

(*a.*) Eczema.
(*b.*) Porrigo.
(*c.*) Pemphigus.

2. Give the best account you can of dengue fever, now raging in India.

3. Describe febris recurrens, relapsing fever, its etiology, symptoms and course, diagnosis, and general treatment.

Military Surgery and Surgical Anatomy.

1. A man is thrown from his horse, and severe concussion of the brain results from the fall:—

Describe (*a*) The symptoms indicative of injury; and
(*b*) The morbid appearances commonly observed about the brain and its membranes in such cases.

2. You are put in charge of a party of bearers with stretchers and ordered to superintend the clearance of part of a battle-field of its wounded. The injuries are of the various kinds usually met with under such circumstances. What are the principal points to which you would direct your attention in executing this duty?

3. A soldier falls with a rifleshot fracture of both bones of the leg on a field of action. The nature of the wound is such as to present a fair prospect of recovery with preservation of the limb under a proper course of treatment. Describe the steps necessary to be taken and the treatment to be followed in order that such a cure may be obtained. Commence your description from the time the man is first attended to on the field up to the termination of the case in the hospital to which the patient may have been finally taken.

4. Describe with precision the operation of resection of the hip-joint. Name the anatomical structures successively divided by your incisions.

Hygiene.

1. What are the best means of purifying water on the march and in camp? What are the chief rules for finding water, and what precautions should be taken to prevent a water supply from being made impure?

2. How would you examine the condition of a barrack which was reported to furnish a larger percentage of sickness among the men than adjacent barracks?

3. How would you determine the quality of fresh beef and pork?

Pathology.

1. Name and define the varieties of rheumatism given in the nomenclature of the College of Physicians.

2. Give an account of the pathology of lardaceous disease, naming the organs where it is most commonly seen, and the conditions under which it most frequently occurs.

3. Describe the first appearance and course of *Herpes Preputialis*.

APPENDIX No. XIV.

CIRCULARS, GENERAL ORDERS, &c.,

HAVING REFERENCE TO THE MEDICAL DEPARTMENT, FROM 7TH MARCH 1873 TO 1ST MARCH 1874.

1st.—ARMY CIRCULARS.

Hospital Comforts for Women and Children.

Clause 56. 1st May 1873.

Medical comforts or diets ordered on the authority of Commanding or Medical Officers for wives and children of persons other than those specified in §§. 57 to 71, Clause 53, Army Circulars, 1871, cannot be sanctioned as a public charge. The value of articles so issued will be recovered from the Officers on whose certificates the issues were made.

Forage Allowance.

Clause 88. 1st July.

When the issue of forage, or the money allowance in lieu thereof, is made to Departmental Officers who only draw Forage or Forage Allowance when their duties require them to be mounted, the words "were actually kept by "us" may be omitted from the Certificate on War Office Form No. 648.

Royal Warrant.

Clause 139.

VICTORIA R. 1st November.

Whereas We have been pleased to make certain alterations in the Regulations for the Medical Service of Our Army, contained in Our Warrant of 1st March 1873;

Our will and pleasure is that from the date of Our said Warrant, the following rule shall govern the pay of Surgeons after 15 years' service, and that the provisions of Article 6 of Our said Warrant shall not be applicable to Officers who, before the 1st March 1873, were entitled to forage in virtue of their several ranks:—

I. The pay of a Surgeon after fifteen years' service in that rank shall be seventeen shillings and sixpence a-day.

II. Officers of the Army Medical Department who, prior to 1st March 1873, were in receipt of forage or forage allowance in virtue of their several ranks, shall continue to receive forage or forage allowance for the number of horses to which they were entitled before that date, in accordance with the regulations then in force.

Given at Our Court at Balmoral, this 23rd day of October 1873, in the 37th Year of Our Reign.

By Her Majesty's Command,
EDWARD CARDWELL.

Duties in connection with Hospitals.

Clause 155. 1st December.

The following will be substituted for paragraphs 23 and 26, Clause 44, Army Circulars, 1873.

23. The Monthly Abstract of Diets and Extras (W. O. Form 175), and the Monthly Statement of Provisions, &c., received, expended, and remaining (W. O. Form 184) will be sent at the end of each month to the Control Officer or his representative at the Station, who will ascertain the correctness of the computation of both Forms, and see that they are duly certified and agree as regards expenditure. The Diet Sheets (W. O. Form 1145) and Extra Sheets (W. O. Form 1200) will, at the end of each month, be sent by the Medical Officer in charge direct to the Principal Medical Officer of the District.

26. The Principal Medical Officer will supervise the nature and quantities of diets and extras, detailed by W. O. Forms 1145 and 1200, as suited to individual cases. It will be his duty to call for explanation of any seeming excess of issue, to check irregularities, or any apparent waste or extravagance, and to report the same, with his opinion thereon, to the Director-General, Army Medical Department, for such action as may be necessary.

Field Stretcher (issued with Army Circulars dated 1st December 1873).

A pattern of this article has been sealed to govern supplies with ambulance wagons of Mark III. only (§. 2542).

It consists of a tarred canvas bottom, attached to two ash poles, which are kept at the required distance apart by two jointed galvanized iron rods. It is fitted with four short iron legs, and has a pillow secured to the head.

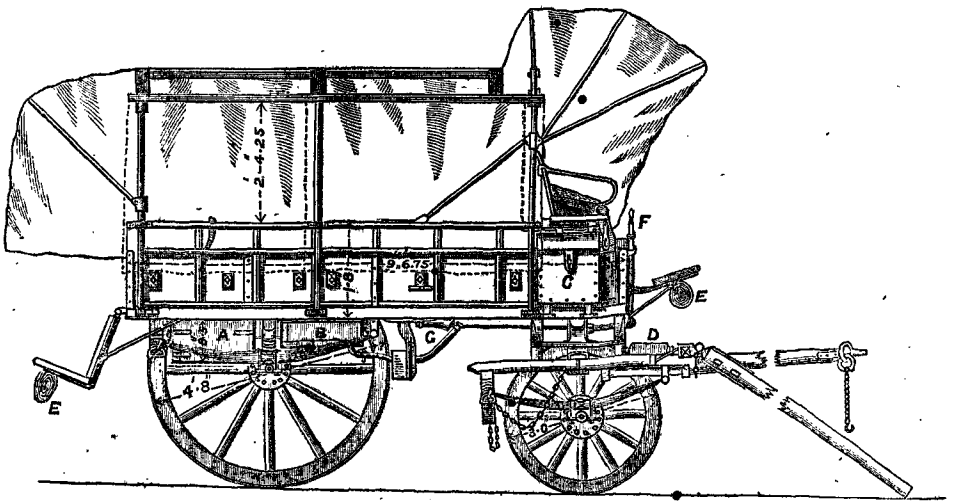
Ambulance Wagon (issued with Army Circulars dated 1st December 1873).

A pattern of the above-mentioned wagon has been sealed to govern future manufacture.

It is constructed to carry seven sick or wounded men,—viz., two inside on stretchers, two seated beside the driver, and three seated in rear.

The wagon consists, generally, of a wood-framed body, a roof, and a fore-carriage (to lock under), mounted upon steel springs. The axletrees are of iron, with new pattern third class arms. The wheels are of the Madras pattern (third class) with naves having wrought-iron flanges and gun-metal pipes, the fore and hind wheels being of 3 feet and 4 feet 8 inches diameter respectively. It is provided with a cover, curtains, and hood, of canvas, water-proofed on the top. These are extended on a skeleton-framed roof, constructed in two pieces (which are hinged together for folding), and on galvanised iron hoops, which, with the roof, are attached to, and supported by six galvanized tubular iron standards fitting into sockets fixed to the wagon sides.

Scale, about $\frac{1}{24}$ full size.



A corn-locker, A, and a water tank, B, are carried under the body. The locker is accessible from two openings with lids, formed in the bottom of the body, and will contain three bushels; the tank is fitted with a leather funnel and tube, G, and will contain 9½ gallons. A moveable box, C, is carried on each side, one for wine, the other for tools, small stores, &c. A short ladder is provided; when in use it is attached to loops on the near side of the wagon, when not in use it is carried on the fore carriage at D. The tailboard and front footboard are supported by iron jointed stays, and are provided with leather aprons, E. A drag shoe and double brake are fitted to the wagon, the latter is worked from the off side at F.

The interior of the wagon is divided by a longitudinal partition, and is fitted to receive two field service folding stretchers with pillows (§. 2541); each stretcher is supported upon two wood rests, with metal crutches, sliding upon guides.

	Cwt.	qrs.	lbs.
Weight of wagon, complete	17	2	23
Stretchers, two	0	2	5
	18	1	0
Weight of a fore wheel	0	3	17½
„ hind wheel....	1	1	0
Tonnage of wagon, complete	3·625 tons.		
Track of wheels (2-inch tire)	5 feet 2 inches.		
Distance between centres of axletrees	5 „	11½	„

Clause 9. 1st January 1874.

4. All W. O. Forms and Books required by Medical Officers attached to Regiments or Corps, or in other medical charge, will in future be obtained from the Principal Medical Officer of the District by requisition, on W. O. Form 698.

5. Principal Medical Officers will include in their requisitions on W. O. Form 165, the necessary supplies of W. O. Forms, Books, &c., including all those for the dieting of sick, which are likely to be required for every demand in their districts.

6. W. O. Forms 196, 197, 198, and 584, which have been hitherto included in the list of "Medical Forms," will in future be demanded by Officers Commanding Regiments and Corps.

2nd.—GENERAL ORDERS.

Deserters.

G. O. 45. 1st June 1873.

The medical examination of deserters, required by paragraph 435 of "The Queen's Regulations and Orders for the Army," is to be dispensed with in future.

Sick Reports on Soldiers.

G. O. 14. 1st February 1874.

In future, the "Company's Sick Report" of every non-commissioned Officer or Soldier brought before a Medical Officer on account of sickness will be made out according to the form subjoined, on a slip of paper at least the size of one-third of a sheet of foolscap.

The christian name must be given in full.

*Regiment. *Company.
*Battalion, corps, or brigade. *Troop or battery.

Regl. No.	Rank and Name (If soldier be married) "M" under name.		Completed years of		Religion.	If for Duty.	Whether a Defaulter.	Disease.	Medical Officer's Remarks, with Initials.
			Age.	Service.					

Orderly Serjeant.

3rd.—DEPARTMENTAL CIRCULARS, &c.

Use of Chloroform.

Circular. 25th March 1873.

The use of Chloroform, for any but a strictly professional purpose, is altogether prohibited.

T. G. LOGAN, *Director-General.*

Circular No. 15—Statistical. 28th April 1873.

Attention is specially called to the following Instructions, relative to the Weekly and Annual Sick Returns, which the formation of Brigade Depôts will render necessary :—

1. The sickness and mortality of the Non-commissioned Officers and Men of the Regular Troops only, composing the Brigade Depôt, are to be included in one Weekly Return, W. O. Form 294; but a table as below is to be inserted in MS. on the 4th page, showing the number of Officers, Non-commissioned Officers, men, women, and children, actually present at the Brigade Depôt.

RETURN showing the whole of the Force serving at the _____ Brigade Depôt.

		Strength.	Admitted to Hospital, placed on Sick List, or came under Medical Treatment.	Discharged.	Died.	Remain under Treatment.
Regular Troops	Officers					
	*Non-Com. Officers and Men, including Recruits					
	Women					
	Children					
Militia and Volunteers, when attached to Brigade Depôt	Officers					
	Non-Com. Officers and Men, including Recruits					
	Women					
	Children					
Army Reserve	Officers					
	Non-Com. Officers and Men					
	Women					
	Children					

* The details of the strength and sickness of these Non-Commissioned Officers and Men, *only*, are to be included in pages 1 and 2 of the Weekly Return of Sick.

2. The Weekly Return is to include the deaths of all men of the Regular Troops belonging to the Brigade Depôt, whether present or detached, exclusive only of invalids dying at sea on passage home, or at Netley, or the port of disembarkation.

3. A separate Admission and Discharge Book is to be kept for the Regular Troops of the Brigade Depôt, in which all cases of sickness, and the deaths of the men composing it, are to be entered.

4. When the strength of any of the other portions of the force exceeds 50 men (including Recruits), a Weekly Return of Sick is to be sent in for them, clearly marked on page 1 to show the description of force to which it applies.

5. The Medical Officer of each Brigade Depôt will, at the close of each year, prepare from the Admission and Discharge Book of the Regular Troops a complete Annual Return (W. O. Form 298) for the Depôt, from 1st January to 31st December, embracing the sickness and mortality (excepting the deaths referred to in paragraph 2), and accompanied by the usual documents as per list on page 4 of that Form; and by a Table similar to the above, giving the details of the entire force for the year.

6. The arrival of any Regimental Depôt at a Brigade Depôt is to be at once reported to this Office by the Medical Officer of the Station, and he will, at the same time, state whether the instructions in paragraph 4 of the circular of 10th February 1870, have been complied with.

7. For the year 1873, the Annual Return of Sick of each Brigade Depôt will commence from the date of its formation.

The Medical Officer in charge must, however, in the case of each Regimental Depôt which was serving on 1st January last, compile from the documents which will be forwarded to him under instructions in paragraph 4 of circular of 10th February 1870, a Return of Sick on W. O. Form 298, showing the Sickness and Mortality in such Depôt from 1st January 1873, to the date of its joining the Brigade Depôt under his charge.

T. G. LOGAN, *Director-General.*

Examinations on Promotion.

Letter. 27th June.

Several instances having occurred of Assistant Surgeons (now Surgeons) having forwarded Annual Reports as part of their examinations for promotion, instead of an original Medico-Topographical or Statistical Report specially prepared for the occasion, Principal Medical Officers are requested to impress upon every Medical Officer who may be called upon to conduct these examinations the necessity of enforcing a strict compliance with the rules on this subject.

T. G. LOGAN, *Director-General.*

APPENDIX No. XV.

ABSTRACT No. 1, showing the Admissions into Hospital, Deaths, and Invaliding among the Troops in the United Kingdom in 1872.

	Household Cavalry.			Cavalry.			Royal Artillery.			Foot Guards.			Infantry Regiments.			Royal Artillery Depôt Brigade.			Depôts.		
Strength	1,200			10,532			12,957			6,181			44,551			2,614			7,687		
Diseases.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.
I. *General Diseases.*																					
1. Febrile:																					
Small Pox..	1	..	..	20	2	..	16	1	..	8	..	..	51	8	..	1	..	..	18	2	..
Cow Pox	..	..	..	15	..	..	34	..	..	1	..	..	16	..	..	45	..	..	9	..	..
Chicken Pox	..	..	..	1	..	..	..	..	..	1	..	..	9	..	..	..	..	..	..	..	..
Measles	2	..	..	11	..	..	18	..	..	2	..	..	113	3	..	3	..	..	24	..	..
Scarlet Fever	..	..	..	2	..	..	7	..	..	5	..	..	23	1	..	..	..	..	10	..	..
Typhus „	..	..	..	..	..	..	..	..	..	1	..	..	3	2	..	..	..	..	1	..	..
Enteric „	1	..	..	6	1	..	20	5	..	10	1	..	38	11	..	3	1	1	5	3	..
Relapsing Fever	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Simple Continued Fever.. ..	3	..	..	64	1	..	78	..	..	102	2	..	299	4	..	17	..	..	49	1	..
Febricula	7	..	..	108	..	..	193	..	..	45	..	..	461	..	..	33	..	..	101	..	..
Ague	..	..	..	18	..	..	237	..	3	8	..	..	510	..	1	171	..	1	78	..	3
Remittent Fever	..	..	..	..	..	..	5	..	..	..	..	..	2	..	..	1	..	..	2	..	..
Choleraic Diarrhœa	..	..	..	..	..	..	2	..	..	1	..	..	1	..	..	..	..	..	..	..	..
Mumps	1	..	..	8	..	..	6	..	..	4	..	..	64	..	..	2	..	..	11	..	..
Influenza	3	..	..	59	..	..	64	..	..	71	..	..	189	..	..	28	..	..	42	..	..
Erysipelas..	..	..	..	22	1	1	22	1	..	8	..	..	78	4	..	16	..	2	14	..	2
Pyæmia	..	..	..	1	1	..	..	..	..	1	1	..	1	1	..	..	..	..	..	1	..

2. Constitutional:																													
Acute Rheumatism	..	..	20	..	..	188	1	..	220	..	..	92	..	..	566	1	1	67	1	1	127	..	1
Gonorrhœal „	..	..	..	..	..	3	..	..	..	..	..	6	..	..	7	..	..	4	..	..	5	..	..
Muscular „	..	..	16	..	..	75	..	..	165	..	1	14	..	..	284	..	3	42	..	..	114	..	..
Chronic „	..	..	9	..	2	150	..	25	243	..	29	77	..	10	713	..	96	51	..	1	188	..	37
Gout	..	..	2	..	..	13	..	..	8	..	..	4	..	..	14	..	..	1	..	..	4	..	..
Chronic Osteo-Arthritis ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	2	..	..
Primary Syphilis	..	..	67	..	..	868	..	1	884	..	..	1055	..	..	2439	1	28	157	..	..	440	..	..
Secondary „	..	..	19	..	1	290	..	9	331	2	13	244	..	5	967	3	13	39	..	4	190	..	22
Cancer	..	..	..	..	..	..	..	..	3	1	..	..	..	..	5	4	..	..	..	..	2	1	..
Lupus	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Leprosy	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Scrofula	..	..	..	..	..	16	..	5	11	..	2	5	..	2	43	..	8	1	..	1	18	1	5
Tabes Mesenterica ..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
Morbus Coxarius	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Ac: Miliary Tuberculosis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	4	1	..	..	..	..	1	..
Phthisis Pulmonalis ..	..	..	11	2	8	79	16	50	119	22	62	53	16	23	381	105	169	33	3	15	110	22	75
Hæmoptysis (Tubercular)	..	..	3	..	..	21	..	1	18	..	2	21	2	10	66	3	7	2	..	..	15	..	1
Diabetes	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..
Purpura	..	..	..	..	..	1	..	1	3	..	..	1	..	..	1	..	..	..	..	..	2	..	..
Scurvy	..	..	..	..	..	1	..	..	2	..	..	..	..	..	3	..	..	..	..	..	..	..	..
Anæmia	..	..	1	..	..	15	..	2	9	..	..	12	..	3	66	1	6	..	..	..	26	..	1
General Dropsy	..	..	..	..	..	2	..	..	3	..	..	1	..	..	6	..	2	2	..	..	4	..	..
II. *Local Diseases.*																							
1. Nervous System:																							
Encephalitis	..	..	..	..	..	4	1	3	2	..	1	..	..	..	8	2	..	1	..	..	5	1	..
Headache	..	..	..	..	..	1	..	..	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Meningitis	..	..	..	..	..	..	..	1	4	1	1	..	..	..	4	4	..	1	..	..	3	1	1
Inflammation of Brain ..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	1	..	..
Softening of Brain ..	..	..	..	..	..	1	1	..	1	1	..	..	..	1	2	1	..	..	..	..	1	1	1
Abscess of Brain	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	1	1	..
Apoplexy	..	..	..	..	..	..	2	..	6	2	..	1	1	..	6	4	1	1	..	..	1	1	..
Sunstroke	..	..	2	..	..	..	..	..	1	..	..	1	..	..	2	..	..	..	..	..	..	..	..

Abstract No. 1—*continued.*

Diseases.	Household Cavalry.			Cavalry.			Royal Artillery.			Foot Guards.			Infantry Regiments.			Royal Artillery Depôt Brigade.			Depôts.		
Strength	1,200			10,532			12,957			6,181			44,551			2,614			7,687		
	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.
Tumour of Brain	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	2	..
Spinal Meningitis	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..
Myelitis	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..
Spinal Atrophy	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..
Neuroma	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..
Paralysis	..	..	..	4	..	..	4	..	2	17	..	4	8	..	4	53	..	20	7	1	1	20	4	8
Locomotor Ataxy	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..
Tetanus	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Epilepsy	..	..	..	3	..	..	25	..	15	68	1	32	12	..	4	126	1	52	12	..	7	60	1	37
Convulsions	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	1	..	..	..	1	..	..
Spasm of Muscle	..	..	..	..	..	..	..	..	..	1	..	1	..	..	..	1	..	..	..	..	..	..	..	..
Stammering	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	..	..	..	..	..	..
Chorea	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Hysteria	..	..	..	..	..	..	2	..	..	1	..	..	..	..	..	..	..	..	2	..	..	1	..	..
Catalepsy	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Neuralgia	..	..	..	7	..	..	23	..	..	50	..	1	22	..	..	130	..	2	13	..	..	31	..	2
Anæsthesia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Insomnia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Hypochondriasis	..	..	..	..	..	..	2	..	..	2	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Mania	..	..	..	1	..	..	1	..	1	5	..	1	2	..	2	13	..	9	2	..	..	1	..	..
Dementia	..	..	..	1	..	1	13	..	5	17	..	7	5	..	3	46	2	27	11	..	1	5	..	1
																						20	1	12

| | | |

Abstract No. 1—*continued.*

Diseases.	Household Cavalry.			Cavalry.			Royal Artillery.			Foot Guards.			Infantry Regiments.			Royal Artillery Depôt Brigade.			Depôts.		
Strength	1,200			10,532			12,957			6,181			44,551			2,614			7,687		
	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.
3. Of the Ear:																					
Inflammation of Meatus	..	..	..	7	..	..	15	..	..	2	..	..	27	..	..	5	..	..	5	..	..
Abscess	..	..	..	..	..	..	2	..	..	..	..	..	9	..	..	..	..	..	1	..	..
Accumulation of Wax	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Polypus	..	..	..	..	..	..	1	..	1	..	..	..	3	..	..	..	..	..	..	..	..
Inflammation Membr: Tympani	..	..	..	3	..	..	11	..	..	1	..	..	65	..	1	3	..	..	15	..	..
Perforation „ „	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Necrosis of Petrous Bone	..	..	..	..	..	1	..	..	..	..	..	..	1	..	1	..	..	..	..	..	..
Deafness	..	..	..	9	..	2	24	..	5	6	..	1	42	..	13	5	..	2	10	..	5
4. Of the Nose:																					
Ozœna	..	..	..	1	..	..	1	..	..	..	..	..	1	..	1	..	..	..	1	..	..
Ulceration of Pituitary Membr	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Epistaxis	..	..	..	3	..	..	6	..	..	3	..	..	11	..	..	..	..	..	3	..	1
Polypus	..	..	..	..	..	..	3	..	..	..	..	..	1	..	..	..	..	..	..	..	..
5. Circulatory System:																					
Pericarditis	..	..	..	7	..	2	10	..	2	3	1	..	11	3	1	1	..	..	2	1	..
Endocarditis	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..
Valve Disease of Heart	..	..	1	31	3	14	60	12	24	20	2	17	154	10	74	17	..	10	43	2	31
Hypertrophy „	..	1	..	1	6	..	6	17	1	9	4	1	5	49	1	33	1	..	..	28	..	9
Atrophy „	..	..	..	2	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..

Degeneration of heart	..	..	..	..	1	1	..	2	2	2	..	..	..	4	3	1	..	..	..	1	..	1
Atheroma of Aorta	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..
Rupture of Auricle of Heart	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..
Angina Pectoris ..	..	..	..	..	2	..	..	..	..	..	..	..	..	3	..	..	..	..	1	1	..	1
Syncope	..	..	..	..	2	..	..	1	..	..	..	..	..	8	..	..	..	1	..	1	2	..
Palpitation ..	..	..	..	..	34	..	10	119	..	36	9	..	2	264	..	54	36	..	6	66	..	22
Narrowing of Aorta	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Dilatation „	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	1	..	..
Dilatation of Heart	..	..	..	..	1	1	1	..	..	..	..	..	..	..	1	..	1	..	..	..	..	1
Aneurism of Aorta	..	..	..	..	6	5	3	7	8	6	1	3	..	26	21	11	4	3	2	7	9	3
Aneurism ..	..	..	..	..	3	..	..	8	1	1	1	..	1	7	..	4	1	..	..	3	1	4
Phlebitis	..	..	..	..	1	..	..	3	..	..	..	..	..	4	1	..	..	..	..	..	..	..
Varicose Veins ..	..	..	..	..	13	..	15	15	..	5	10	..	1	54	..	35	..	..	..	19	..	11
Nævus Vascularis ..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
6. Absorbent System:																						
Inflammation of Lymphatics	..	..	..	..	1	..	..	1	..	..	..	..	..	13	..	..	..	..	..	2	..	..
Inflammation of Glands ..	..	6	..	..	109	..	..	169	..	..	59	..	1	427	..	2	43	..	..	73	..	..
Suppuration „	..	4	..	..	26	..	..	18	..	..	14	..	..	39	..	..	5	..	..	2	..	..
Hypertrophy „	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	2	..	..
Glandular Tumour	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
7. Of Ductless Glands:																						
Inflammation of Thyroid Gland		..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Addison's Disease	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..
8. Respiratory System:																						
Coryza	..	..	..	..	11	..	..	..	..	..	..	..	..	2	..	..	..	..	..	1	..	..
Laryngitis	..	..	..	..	6	..	..	1	..	..	1	..	..	8	..	..	4	..	..	1	..	..
Aphonia	..	..	..	..	..	..	..	1	..	..	..	..	..	2	..	..	..	..	..	..	..	..
Bronchitis ..	..	90	1	..	590	..	9	1056	3	17	259	2	8	2672	9	61	226	1	3	660	..	20
Asthma	..	..	..	..	10	..	1	6	..	1	1	1	1	22	..	5	3	..	1	4	..	2

Abstract No. 1—*continued.*

Diseases.	Household Cavalry.			Cavalry.			Royal Artillery.			Foot Guards.			Infantry Regiments.			Royal Artillery Depôt Brigade.			Depôts.		
Strength	1,200			10,532			12,957			6,181			44,551			2,614			7,687		
	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.
Pneumonia	5	..	..	52	5	1	69	7	..	29	6	..	223	35	4	14	3	1	58	11	..
Abscess of Lungs	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	1	..
Pulmonary Extravasation	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
Emphysema	..	..	..	1	..	..	2	..	2	..	..	..	..	..	1	..	..	..	..	..	1
Pleurisy	1	..	..	20	1	..	37	1	6	26	1	1	122	1	5	3	..	..	36	1	3
Empyema	..	..	..	..	1	..	..	..	..	..	..	..	2	2	..	..	..	..	1	..	1
Hydrothorax	..	..	..	..	..	..	1	..	..	..	..	..	1	..	1	..	..	..	..	..	..
9. Digestive System:																					
Stomatitis	..	..	..	..	..	..	6	..	..	..	..	..	14	..	..	..	..	..	5	..	..
Thrush	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..
Abscess of Cheek	..	..	..	..	..	..	..	..	..	..	..	..	7	..	1	2	..	..	..	..	..
Ranula	1	..	..	..	..	..	1	..	..	1	..	..	2	..	..	1	..	..	..	..	..
Abscess of Antrum	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Caries of Dental Tissue	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..
Tumour of Jaw	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Necrosis of Jaw	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Gum Boil	..	..	..	22	..	..	36	..	..	..	..	..	60	..	1	19	..	..	12	..	..
Inflammation of Gums	..	..	..	..	..	..	1	..	..	..	..	..	13	..	..	1	..	..	..	..	..
Polypus	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Glossitis	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	..	..	..	..	..	..
Abscess of Tongue	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Sore Throat	..	..	..	37	..	..	80	..	..	1	..	..	18	..	..	6	..	..	9	..	..

| | | |

Abstract No. 1—*continued.*

Diseases.	Household Cavalry.			Cavalry.			Royal Artillery.			Foot Guards.			Infantry Regiments.			Royal Artillery Depôt Brigade.			Depôts.		
Strength	1,200			10,532			12,957			6,181			44,551			2,614			7,687		
	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.
Condyloma of Anus	..	..	..	2	..	..	5	..	..	..	..	..	27	..	..	..	..	..	11	..	..
Tænia	..	..	..	3	..	..	13	..	..	..	..	..	35	..	1	7	..	..	2	..	..
Ascaris Lumbricoides	..	..	..	..	..	..	..	..	..	..	..	..	6	..	..	..	..	..	1	..	..
Hepatitis	..	..	1	..	..	67	..	13	103	2	14	6	1	1	187	4	21	52	2	11	151	1	33
Abscess of Liver	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	5	..	..	..	..	3	2	..
Atrophy of Liver	..	..	..	..	..	..	..	..	1	..	1	..	..	..	..	1	..	..	..	..	..	..	..
Simple enlargement of Liver	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..
Congestion of Liver	..	..	..	..	..	..	..	..	3	..	..	1	..	..	21	..	5	2	..	..	4	..	..
Cirrhosis	..	..	..	..	..	..	..	..	1	2	..	3	..	2	6	4	..	..	..	..	1	..	..
Lardaceous Liver	..	..	..	..	..	1	..	..	..	..	..	..	..	..	1	..	..	1	..	1	..	..	..
Jaundice	..	..	..	2	..	..	34	..	1	48	..	..	52	..	..	143	..	..	7	..	..	27	..	..
Gallstones	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..
Splenitis	..	..	..	..	..	..	..	..	8	..	..	..	..	..	17	..	1	1	..	..	7	..	1
Congestion of Spleen	..	..	..	..	..	..	..	..	1	..	..	..	..	..	5	..	1	..	..	..	3	..	..
Hypertrophy of Spleen	..	..	..	..	..	..	..	..	..	..	..	1	1	..	1	..	3	..	..	..	1	..	2
Peritonitis	..	..	..	..	..	4	2	..	4	1	..	1	2	..	8	3	..	1	..	..	3	2	..
Ascites	..	..	..	..	..	..	..	..	..	..	..	3	1	..	7	1	..	1	..	1	3	1	2
Tumour	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
10. Urinary System:																							
Bright's Disease	..	..	1	..	..	4	2	1	8	4	1	4	..	3	29	5	6	..	..	..	7	2	3
Nephritis	..	..	..	..	..	12	..	1	7	..	..	2	..	..	11	..	..	1	..	1	1	..	1

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Abstract No. 1—*continued.*

	Household Cavalry.			Cavalry.			Royal Artillery.			Foot Guards.			Infantry Regiments.			Royal Artillery Depôt Brigade.			Depôts.		
Strength	1,200			10,532			12,957			6,181			44,551			2,614			7,687		
Diseases.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.
Orchitis	10	..	..	142	..	6	184	..	1	42	..	..	344	..	3	33	..	..	73	..	1
Abscess of Testicle	..	..	..	1	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..
Sarcocele	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..
Malposition of Testicle	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	3	..	..	..	..	..
Spermatorrhœa	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	2	..	..	1	..	..
Neuralgia of Testicle	..	..	..	..	..	1	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Inflammation of Mamilla ..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..
Hypertrophy of Mamilla ..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
12. Organs of Locomotion:																					
Ostitis	..	..	..	11	..	1	19	..	1	14	..	2	46	..	11	6	..	1	8	..	3
Caries	..	..	..	4	..	2	..	..	..	1	..	1	5	..	3	..	..	1	8	..	2
Necrosis	..	..	..	3	..	2	4	..	40	3	..	1	8	..	3	..	..	..	4	..	3
Tumour	..	..	..	2	..	..	..	..	..	..	..	..	13	..	1	1	..	..	2	..	..
Exostosis	..	..	..	4	..	2	..	..	..	..	..	..	1	..	..	..	..	..	1	..	1
Synovitis	3	..	..	26	..	2	27	..	1	8	..	..	91	..	6	5	..	4	17	..	4
Dropsy of Joint	..	..	..	..	..	..	1	..	..	..	..	..	6	..	1	..	..	..	..	..	..
Loose Cartilage	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
Relaxation of Ligaments ..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Displacement of Cartilage ..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..
Ulceration of Cartilage ..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	..	..	..	..	..	..
Psoas Abscess	..	..	..	..	..	..	1	2	..	..	..	..	1	..	1	..	..	..	1	..	1
Curvature of Spine	..	..	..	..	..	..	..	..	..	..	..	..									

Malformations of feet and hands	..	..	..	..	..	..	2	..	..	..	..	..	3	..	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Inflammation of Muscle	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Atrophy of Muscle	..	..	..	..	..	..	..	..	..	1	..	1	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Exhaustion of Muscle	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
Contraction	..	..	..	..	..	6	..	4	10	..	6	..	..	..	17	..	11	3	..	2	4	..	4	..	..	..	..	..	..	..	..	4
Club Foot	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Enlarged Bursa	..	..	..	..	..	2	..	..	..	..	..	1	..	..	1	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
Bursal Abscess	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bunion	..	..	..	..	..	2	..	..	4	..	..	..	..	..	10	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
Ganglion	..	..	..	..	..	..	..	..	2	..	..	1	..	..	2	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
13. Of Cellular Tissue:																															
Inflammation of Cellular Tissue	..	..	..	21	..	..	32	..	..	3	1	..	184	1	1	12	..	..	30	1	..	..	..	..	..	..	..	..	..	..	..	..
Abscess	"	"	35	..	1	209	..	2	334	..	1	155	..	1	589	1	1	39	..	..	99	..	..	..	..	..	..	..	..	..	..	..
Obesity	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
Tumour	..	..	..	..	..	1	..	..	1	..	1	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
Guinea Worm	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..
14. Cutaneous System:																																
Erythema	..	..	..	1	..	..	5	..	..	9	..	..	4	..	..	18	..	..	2	..	..	7	..	..	..	..	..	..	..	..	..	..
Intertrigo	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Roscola	..	..	..	..	..	..	..	..	..	4	..	..	..	..	..	1	..	..	4	..	..	2	..	..	..	..	..	..	..	..	..	..
Urticaria	..	..	..	1	..	..	3	..	..	9	..	..	6	..	..	17	..	..	3	..	..	7	..	..	..	..	..	..	..	..	..	..
Prurigo	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	4	..	..	1	..	..	1	..	..	..	..	..	..	..	..	..	..
Lichen	..	..	..	..	..	..	..	..	..	4	..	..	2	..	..	7	..	..	2	..	..	1	..	..	..	..	..	..	..	..	..	..
Psoriasis	..	..	..	2	..	..	11	..	..	26	..	2	6	..	..	79	..	1	5	..	..	16	..	3	..	..	..	..	..	..	..	..
Herpes	..	..	..	3	..	..	15	..	..	60	..	..	13	..	..	96	..	..	6	..	..	17	..	..	..	..	..	..	..	..	..	..
Pemphigus	..	..	..	..	..	..	3	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
Eczema	..	..	..	2	..	..	82	..	..	79	..	2	46	..	..	436	..	1	17	..	..	71	..	2	..	..	..	..	..	..	..	..
Impetigo	..	..	..	1	..	..	3	..	..	4	..	..	7	..	..	22	..	..	4	..	..	1	..	..	..	..	..	..	..	..	..	..
Rupia	..	..	..	..	..	..	2	..	..	1	..	..	..	..	..	3	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Ecthyma	..	..	..	..	..	..	..	..	..	5	..	..	..	..	..	4	..	..	9	..	..	..	..	..	..	..	..	..	..	..	..	..
Acne	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	24	..	..	1	..	..	7	..	..	..	..	..	..	..	..	..	..
Sycosis	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Chilblain	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	2	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
Ulcer	..	..	..	36	..	..	514	..	14	513	..	4	131	..	..	986	..	13	118	..	2	277	..	7	..	..	..	..	..	..	..	..

Abstract No. 1—*continued.*

Diseases.	Household Cavalry.			Cavalry.			Royal Artillery.			Foot Guards.			Infantry Regiments.			Royal Artillery Depôt Brigade.			Depôts.		
Strength	1,200			10,532			12,957			6,181			44,551			2,614			7,687		
	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admit ed.	Died.	Invalided.
Boil	24	..	..	369	..	..	301	..	..	35	..	..	729	..	..	49	..	..	168	..	..
Carbuncle	..	..	..	11	..	..	8	..	..	1	..	..	27	..	..	1	..	..	1	..	..
Whitlow	8	..	..	69	..	..	78	..	..	9	..	..	155	..	..	12	..	..	39	..	..
Corns	2	..	..	2	..	..	7	..	..	2	..	..	21	..	1	2	..	..	1	..	..
Tumour (not defined)	1	..	..	1	..	..	10	..	..	..	..	..	10	..	..	1	..	..	2	..	1
Mole	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Warts	4	..	..	24	..	..	74	..	..	24	..	..	97	..	..	25	..	..	20	..	..
Delhi Boil	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Ingrown Nail	1	..	..	8	..	..	20	..	..	2	..	..	17	..	..	2	..	..	13	..	..
Pruritus	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..	..	..	..	..
Tinea	..	..	..	6	..	..	21	..	..	15	..	..	65	..	..	3	..	..	11	..	..
Itch	6	..	..	84	..	..	163	..	..	31	..	..	886	..	..	62	..	..	230	..	..
Phthiriasis	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	2	..	..	..	..	..
Irritation from Pediculi	..	..	..	1	..	..	4	..	..	..	..	..	4	..	..	..	..	..	1	..	..
Irritation from Phthirius Ing:	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Irritation of Skin	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Sting of Insect	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
III. *Conditions, &c.*																					
General Debility	2	..	1	48	..	14	75	..	12	22	..	4	176	..	61	44	..	8	117	1	56
IV. *Poisons.*																					
Alcohol	..	..	..	1	..	..	8	1	..	..	..	..	30	2	..	..	..	..	3	..	..
Delirium Tremens	..	..	..	19	..	..	14	..	..	21	1	..	53	4	..	6	..	..	12	1	..

| V. *Injuries.* | | |

Abstract No. 1—*continued.*

Diseases.	Household Cavalry.			Cavalry.			Royal Artillery.			Foot Guards.			Infantry Regiments.			Royal Artillery Depôt Brigade.			Depôts.		
Strength	1,200			10,532			12,957			6,181			44,551			2,614			7,687		
	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.
5. Judicial:																					
Hanged	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..
VI. *Surgical Operations.*																					
Amputation of Shoulder	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..
„ Finger	..	..	..	1	..	..	4	..	..	2	..	..	3	..	..	..	..	..	..	..	..
„ Thumb	..	..	..	..	..	..	4	..	..	..	..	..	..	..	..	..	1	..	..	..	..
„ Arm	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	..	..	..	..
„ Thigh	..	..	..	..	..	..	1	..	1	..	..	..	..	..	1	1	1	..	..	..	..
„ Toe	..	..	..	2	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
For ununited Fracture	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	..	..	..	..	..	..
Excision of Eyeball	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
For adhesion of Eyebrow ..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Removal of Testicle	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
Circumcision	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
Excision of Tumour	..	..	..	..	..	..	1	..	..	..	..	..	2	..	..	..	..	..	..	..	..
For Fistula in Ano	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Not stated	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	5	..	..	..
Not known	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	1	..	..	..	..
No appreciable Disease	..	..	..	5	..	..	26	..	..	..	..	..	28	..	..	5	..	..	12	..	..
Total	752	3	17	8182	61	311	12,054	99	404	4,393	49	128	29,846	336	1057	2,920	21	109	6,877	95	526

APPENDIX No. XV—*continued.*

ABSTRACT No. 2, showing the Number of Men belonging to the Regiments serving at Home who were Vaccinated during the Year 1872.

	Results.	In those who bore Marks of previous Small-pox.	In those who bore good Marks of previous Vaccination.	In those who bore doubtful Marks of previous Vaccination.	In those who bore no Marks of previous Vaccination or Small-pox.	Total.
Soldiers, not Recruits.	A perfect vaccine vesicle	612	5,987	573	137	7,309
	A modified ditto	782	8,088	679	107	9,656
	A failure in	710	5,690	464	116	6,980
	Total	2,104	19,765	1,716	360	23,945
Recruits.	A perfect vaccine vesicle	300	5,371	149	312	6,132
	A modified ditto	371	6,378	129	153	7,031
	A failure in	366	3,979	99	141	4,585
	Total	1,037	15,728	377	606	17,748

APPENDIX No. XV—*continued.*

ABSTRACT No. 3, showing the Ages of the Troops serving in the United Kingdom, and the Deaths at each Age, during the Year 1872.

	Under 20.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.		Total.	
	Average Strength.	Died.	Average Strength.	Died.	Average Strength.	Died.	Average Strength.	Died.	Average Strength.	Died.	Average Strength.	Died.	Average Strength.	Died.
Household Cavalry	108	..	368	2	319	1	181	..	133	..	91	..	1,200	3
Cavalry of the Line	1,876	5	3,519	14	2,018	7	1,929	19	955	10	239	6	10,536	61
Royal Artillery	2,257	5	4,745	19	2,336	15	2,337	23	1,062	28	220	9	12,957	99
Foot Guards	1,348	1	1,861	15	1,467	8	899	9	522	11	84	5	6,181	49
Infantry Regiments	11,645	33	11,368	62	7,048	31	9,331	115	4,439	79	720	16	44,551	336
Total	17,234	44	21,861	112	13,188	62	14,677	166	7,111	128	1,354	36	75,425	548
Depôt Brigade, R.A.	646	..	1,146	6	307	3	278	6	178	4	59	1	2,614	20*
Depôts, Line	1,833	4	2,621	26	907	8	1,197	25	914	22	215	10	7,687	95
Coast Brigade, R.A.	2	..	9	..	83	..	300	3	788	17	327	11	1,509	31
Total	2,481	4	3,776	32	1,297	11	1,775	34	1,880	43	601	22	11,810	146

* Age of one man, 2nd Division, Depôt Brigade, R.A., not stated.

APPENDIX No. XV—*continued.*

ABSTRACT No. 4, showing the Number of Recruits Inspected, and the Number found unfit for the Service in each of the Recruiting Districts, during the Year 1872.

Districts.		Primary Inspections.	Secondary Inspections.		Total.
			Had been previously examined by Staff Surgeon or other Army Medical Officer.	Had been previously examined by Private Medical Practitioner.	
London	Inspected	6,563	283	1,004	7,850
	Rejected	2,089	26	94	2,209
Liverpool	Inspected	980	42	60	1,082
	Rejected	319	4	17	340
Bristol	Inspected	560	1	332	893
	Rejected	186	..	39	225
York	Inspected	112	238	192	542
	Rejected	35	19	39	93
Birmingham	Inspected	845	25	420	1,290
	Rejected	266	5	98	369
Devonport	Inspected	215	133	209	557
	Rejected	53	..	19	72
Manchester	Inspected	812	4	50	866
	Rejected	324	1	15	340
Peterborough	Inspected	47	62	359	468
	Rejected	10	1	23	34
Portsmouth	Inspected	230	186	175	591
	Rejected	84	21	30	135
Edinburgh	Inspected	329	12	35	376
	Rejected	90	1	1	92
Glasgow	Inspected	799	64	38	901
	Rejected	307	10	3	320
Inverness	Inspected	19	..	12	31
	Rejected	4	..	..	4
Dublin	Inspected	885	318	139	1,342
	Rejected	262	18	10	290
Total	Inspected	12,396	1,368	3,025	16,789
	Rejected	4,029	106	388	4,523

APPENDIX No. XV—*continued.*

ABSTRACT No. 5, showing the *Native* Countries of the Recruits primarily inspected at the Head-Quarters of each of the Districts in 1872.

Districts.	England.		Wales.		Scotland.		Ireland.		British Colonies or Foreign Countries.	
	Inspected.	Rejected.	Inspected.	Rejected.	Inspected.	Rejected.	Inspected.	Rejected.	Inspected.	Rejected.
London ..	6,148	2,002	50	10	113	26	202	44	50	7
Liverpool ..	696	240	28	7	64	20	184	49	8	3
Bristol ..	445	155	75	22	11	2	29	7	..	..
York	100	33	1	..	2	1	6	1	3	..
Birmingham ..	817	254	7	4	5	2	15	5	1	1
Devonport ..	197	48	2	..	1	..	11	4	4	1
Manchester ..	649	269	14	8	21	5	125	40	3	2
Peterborough .	47	10	..	..	..	..	..	..	..	..
Portsmouth ..	213	81	1	..	4	..	5	1	7	2
Edinburgh ..	18	2	..	..	296	84	14	4	1	..
Glasgow ..	50	17	1	1	513	203	232	83	3	3
Inverness ..	..	..	..	..	19	4	..	..	..	..
Dublin ..	62	12	..	..	14	3	806	246	3	1
Total ..	9,442	3,123	179	52	1,063	350	1,629	484	83	20

ABSTRACT No. 6, showing the Ages of Recruits Inspected in 1872.

	Boys under 17.	From 17 to 18.	From 18 to 19.	From 19 to 20.	From 20 to 21.	From 21 to 22.	From 22 to 23.	From 23 to 24.	From 24 to 25.	25 and upwards.
At Head-Quarters of Recruiting Districts	350	354	3,776	2,575	1,807	1,216	871	663	637	147
At Regiments and Depôts ...	379	629	2,581	2,743	1,506	939	715	542	389	92
By Civil Medical Practitioners ...	39	51	1,573	1,484	885	487	374	293	265	28
Total	768	1,034	7,930	6,802	4,198	2,642	1,960	1,498	1,291	267

ABSTRACT No. 7, showing the State of Education of Recruits examined at Head-Quarters of Recruiting Districts and at Regiments and Depôts in 1872.

	Unable to Read.	Able to Read only.	Able to Write.	Well Educated.	Total.
Recruiting District ..	1,655	1,744	8,389	608	12,396
Regiments and Depôts	1,608	1,037	7,128	742	10,515
Total	3,263	2,781	15,517	1,350	22,911

APPENDIX No. XV—*continued.*

ABSTRACT No. 8, showing the Heights of the Recruits Inspected in 1872.

	Under 5 ft. 3 in.	From 5 ft. 3 in. to 5 ft. 4 in.	From 5 ft. 4 in. to 5 ft. 5 in.	From 5 ft. 5 in. to 5 ft. 6 in.	From 5 ft. 6 in. to 5 ft. 7 in.	From 5 ft. 7 in. to 5 ft. 8 in.	From 5 ft. 8 in. to 5 ft. 9 in.	From 5 ft. 9 in. to 5 ft. 10 in.	From 5 ft. 10 in. to 5 ft. 11 in.	From 5 ft. 11 in. to 6 ft.	6 ft. and upwards
At Head-Quarters of Recruiting Districts ...	339	72	961	4,282	2,903	1,799	1,025	570	258	128	59
At Regiments & Depôts ...	319	277	1,826	2,649	1,953	1,556	887	501	246	155	146
By Civil Medical Practitioners	33	20	272	1,637	1,274	986	667	364	138	53	35
Total	691	369	3,059	8,568	6,130	4,341	2,579	1,435	642	336	240

ABSTRACT No. 9, showing the Number of Recruits inspected in 1872, at the Head-Quarters of Recruiting Districts, at the following Weights and Ages.

Ages.	Under 100 lbs.	From 100 lbs. to 110 lbs.	From 110 lbs. to 120 lbs.	From 120 lbs. to 130 lbs.	From 130 lbs. to 140 lbs.	From 140 lbs. to 150 lbs.	From 150 lbs. to 160 lbs.	From 160 lbs. to 170 lbs.	From 170 lbs. and upwards.	Total.
Boys under 17	338	7	4	..	1	...	...	...	...	350
From 17 to 18	1	30	162	95	50	12	2	2	...	354
,, 18 to 19	14	140	1,082	1,668	586	220	53	11	2	3,776
,, 19 to 20	...	77	452	1,006	631	291	92	21	5	2,575
,, 20 to 21	2	29	207	652	509	288	91	25	4	1,807
,, 21 to 22	...	11	127	290	435	223	86	34	10	1,216
,, 22 to 23	...	25	81	214	275	169	69	32	6	871
,, 23 to 24	1	1	63	147	205	125	81	27	13	663
,, 24 to 25	...	3	53	111	205	158	71	27	9	637
Upwards of 25	...	...	15	38	58	25	9	1	1	147
Total	356	323	2,246	4,221	2,955	1,511	554	180	50	12,396

APPENDIX No. XV.—*continued.*

ABSTRACT No. 10, showing the Admissions into Hospital and Deaths among the Troops serving in the Mediterranean during the year 1872; and the Disabilities of the Invalids sent to England and of those discharged the service in Malta and at Netley during the same period.

Stations	Gibraltar.		Malta.		Malta Fencible Artillery.		Gibraltar.		Malta.		
Strength	4,066		4,855		592		Invalids.		Invalids.		
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Sent Home.	Discharged at Netley.	Sent Home.	Discharged at Malta.	Discharged at Netley.
1. General Diseases.											
1. Febrile:											
Cow Pox	2	..	..	..	..	..	..	..	..	..	..
Measles	20	..	9	..	..	..	..	..	..	..	..
Scarlet Fever	1	..	..	..	..	..	..	..	..	..	..
Cerebro-Spinal Fever ..	..	..	1	..	..	..	..	..	..	..	..
Enteric Fever	11	3	29	10	3	1	2	..	1	..	..
Simple Continued Fever ..	72	..	650	9	21	..	1	..	1	..	..
Febricula	170	..	453	..	6	..	..	..	..	..	..
Ague	1	..	8	..	..	..	..	..	1	..	..
Remittent Fever	41	..	21	..	..	..	1	..	1	..	..
Simple Cholera	..	..	1	..	..	..	..	..	..	..	..
Diphtheria	..	..	1	..	..	..	..	..	..	..	..
Mumps	5	..	2	..	..	..	..	..	..	..	..
Influenza	10	..	6	..	..	..	..	..	..	..	..
Erysipelas	6	..	6	..	1	..	..	..	..	..	..
Pyæmia	..	..	..	..	1	1	..	..	..	..	..
2. Constitutional:											
Acute Rheumatism ..	32	..	80	..	..	..	4	..	..	..	..
Muscular ,, ...	41	..	77	..	32	..	..	..	..	..	..
Chronic ,, ...	79	..	89	..	..	..	15	3	..	1	2
Gout	3	..	1	..	..	..	..	..	..	..	..
Osteo Arthritis	..	..	1	..	..	..	..	..	..	..	..
Primary Syphilis	263	..	104	..	9	..	..	..	1	..	1
Secondary ,, ...	38	..	63	..	6	..	4	2	1	1	..
Cancer	..	..	..	..	1	..	..	..	..	..	..
Colloid Tumour	..	..	1	..	..	..	..	..	..	..	..
Scirrhus of Pylorus ..	..	1	..	..	..	..	..	..	..	..	..
Lupus	1	..	..	..	..	..	..	..	..	..	..
Scrofula	1	..	5	..	1	..	1	..	..	..	2
Morbus Coxarius	..	..	..	..	..	..	1	1	..	..	..
Phthisis Pulmonalis ..	25	4	53	5	2	..	17	19	15	..	12
Hæmoptysis (Tubercular) ..	2	..	10	..	..	..	..	..	..	..	..
Diabetes	..	..	1	..	1	..	..	..	1	1	..
Purpura	..	..	2	..	..	..	..	..	..	..	..
Anæmia	4	..	8	..	..	..	..	..	..	..	1
General Dropsy	1	..	..	..	1	..	1	..	..	..	..
II. Local Diseases.											
1. Of the Nervous System:											
Encephalitis	1	..	..	..	..	..	..	..	..	..	..
Softening of Brain	..	..	..	..	..	..	..	1	..	..	..
Abscess of Brain	1	1	..	..	..	..	..	..	..	..	..
Apoplexy	..	1	1	1	..	..	..	..	..	..	..
Sunstroke	1	..	..	..	..	..	..	..	..	..	..

Abstract No. 10—*continued.*

Stations	Gibraltar.		Malta.		Malta Fencible Artillery.		Gibraltar.		Malta.		
Strength	4,066		4,855		592		Invalids.		Invalids.		
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Sent Home.	Discharged at Netley.	Sent Home.	Discharged at Malta.	Discharged at Netley.
Myelitis	..	..	..	..	1	1	..	..	..	..	..
Paralysis	8	..	7	..	..	..	..	..	3	..	2
Locomotor Ataxy	..	..	..	..	..	..	..	..	..	..	1
Epilepsy	14	..	10	..	3	..	7	3	2	..	1
Convulsions	..	..	..	..	1	..	..	..	..	..	..
Hysteria	1	..	..	..	..	..	..	..	..	..	..
Neuralgia	6	..	33	..	2	..	1	..	..	..	..
Mania	2	..	1	..	..	..	1	..	1	..	..
Dementia	..	..	12	..	..	..	2	..	6	..	..
2. Of the Eye:											
Conjunctivitis	54	..	158	..	75	..	2	1	1	..	..
Purulent Ophthalmia	..	..	2	..	..	..	..	..	..	..	..
Keratitis	1	..	2	..	..	..	..	..	1	..	1
Ulcer of Cornea	..	..	1	..	..	..	..	..	..	..	1
Opacity of Cornea	..	..	..	..	1	..	..	..	..	1	..
Iritis	1	..	3	..	..	..	..	..	..	..	..
Retinitis	..	..	1	..	..	..	1	..	..	..	..
Amaurosis	..	..	..	..	1	..	..	..	..	..	..
Impaired Vision	..	..	1	..	..	..	..	1	1	2	2
Congestion of Retina	..	..	..	..	..	..	..	..	1	..	..
Cataract	..	..	..	..	..	..	..	1	..	..	..
Short Sight	1	..	..	..	..	..	..	..	..	..	..
Hemeralopia	..	..	2	..	..	..	..	..	..	..	..
Hordeolum	1	..	1	..	1	..	..	..	..	..	..
Tarsal Ophthalmia	1	..	7	..	3	..	1	3	2	..	..
3. Of the Ear:											
Inflam: External Meatus	1	..	11	..	..	..	..	..	..	..	..
Abscess of Ear	5	..	1	..	..	..	..	..	..	..	..
Inflam: Membr: Tympani	8	..	9	..	..	..	..	..	..	..	..
Deafness	4	..	2	..	1	..	3	4	..	..	1
4. Of the Nose:											
Ozœna	3	..	..	..	..	..	1	1	..	..	..
Epistaxis	1	..	2	..	..	..	..	..	..	..	..
Polypus	..	..	1	..	..	..	..	..	..	..	..
5. Circulatory System:											
Pericarditis	1	..	..	..	1	..	..	..	..	..	..
Valve Disease of Heart	8	1	14	..	..	..	6	4	5	..	7
Hypertrophy ,,	4	..	5	..	..	..	2	3	..	..	..
Fatty Degeneratn. of Heart	1	1	..	..	..	..	..	..	..	..	..
Angina Pectoris	..	..	1	..	..	..	..	..	1	..	..
Palpitation	21	..	34	..	..	..	4	6	2	..	3
Functional Derangement of Heart	..	..	..	..	..	..	1	..	..	..	..
Dilatation of Aorta	1	..	..	..	..	..	1	..	..	..	..
Aneurism of Aorta	3	2	3	4	..	..	3	3	..	..	1
Phlebitis	..	..	1	..	..	..	..	..	..	..	..
Varicose Veins	2	..	3	..	2	..	3	3	..	..	..
6. Absorbent System:											
Inflam: of Lymphatics	1	..	..	..	..	..	..	..	..	..	..

Abstract No. 10—*continued.*

Stations	Gibraltar.		Malta.		Malta Fencible Artillery.		Gibraltar.		Malta.		
Strength	4,066		4,855		592		Invalids		Invalids.		
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Sent Home.	Discharged at Netley.	Sent Home.	Discharged at Malta.	Discharged at Netley.
Inflam: of Glands	15	..	33	..	1	..	..	..	..	..	..
Suppuration „	2	..	..	..	..	..	..	..	..	..	..
Enlargement „	1	..	..	..	..	..	..	..	..	..	..
8. Respiratory System:											
Bronchitis	142	1	165	1	36	..	16	5	..	..	..
Asthma	3	..	3	..	..	..	2	1	..	..	..
Pneumonia	10	1	24	3	1	..	..	..	..	..	..
Emphysema	1	..	1	..	..	..	..	..	..	..	..
Pleurisy	12	..	8	..	..	..	2	..	..	..	..
9. Digestive System:											
Abscess of Cheek	..	..	4	..	..	..	..	..	..	..	..
Ranula	..	..	2	..	1	..	..	..	..	..	..
Caries of Teeth	3	..	2	..	..	..	..	..	..	..	..
Gum Boil	4	..	6	..	..	..	..	..	..	..	..
Glossitis	1	..	..	..	..	..	..	..	..	..	..
Sore Throat	4	..	11	..	..	..	..	..	..	..	..
Quinsy	2	..	..	..	..	..	..	..	..	..	..
Tonsillitis	61	..	145	..	41	..	..	..	1	..	..
Tumour of Jaw	..	..	1	..	..	..	..	..	..	..	..
Ulcer of Pharynx	..	..	2	..	..	..	..	..	..	..	..
Gastritis	..	..	..	..	2	1	..	..	..	..	..
Hæmatemesis	3	..	2	1	..	..	..	..	..	..	..
Dyspepsia	86	..	154	..	43	..	2	1	..	..	..
Gastrodynia	2	..	1	..	..	..	..	..	..	..	..
Vomiting	..	..	9	..	..	..	..	..	..	..	..
Enteritis	..	..	..	..	1	..	..	..	..	..	..
Typhlitis	..	..	1	..	..	..	..	..	..	..	..
Dysentery	3	..	15	..	..	..	..	..	..	..	..
Perforation of Colon	..	..	1	1	..	..	..	..	..	..	..
Hernia	7	..	9	..	1	..	6	6	3	4	3
Oxyuris Vermicularis	..	..	1	..	..	..	..	..	..	..	..
Diarrhœa	44	..	145	..	9	..	1	..	1	..	..
Colic	16	..	27	..	..	..	..	..	..	..	..
Constipation	..	..	7	..	..	..	..	..	..	..	..
Fistula in Ano	4	..	2	..	..	..	..	1	1	..	1
Hæmorrhoids	10	..	30	..	6	..	..	..	..	..	..
Fissure of Anus	..	..	1	..	..	..	..	..	..	..	..
Condyloma of Anus	1	..	3	..	..	..	..	..	..	..	..
Tænia Solium	3	..	45	..	..	..	..	..	..	..	..
Hepatitis	9	..	27	..	1	..	4	1	4	..	1
Abscess of Liver	..	..	2	1	..	..	..	..	..	..	..
Enlargement of Liver	1	..	7	..	..	..	..	1	..	..	..
Cirrhosis	2	..	1	..	..	..	2	1	..	..	..
Fatty Liver	..	..	1	..	..	..	..	..	1	..	..
Jaundice	7	..	30	..	2	..	..	..	..	..	..
Splenitis	1	..	..	..	..	..	..	..	..	..	..
Ascites	..	..	3	..	..	..	..	..	..	..	..
10. Urinary System:											
Bright's Disease	1	..	1	1	..	..	..	1	..	..	..
Nephritis	..	..	1	..	..	..	..	..	..	..	..

Abstract No. 10—*continued.*

Stations	Gibraltar.		Malta.		Malta Fencible Artillery.		Gibraltar.		Malta.		
Strength	4,066		4,855		592		Invalids.		Invalids.		
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Sent Home.	Discharged at Netley.	Sent Home.	Discharged at Malta.	Discharged at Netley.
Suppression of Urine	..	..	1	..	..	..	..	..	..	..	..
Diuresis	..	..	1	..	..	..	..	..	..	..	..
Cystitis	1	..	..	..	..	..	..	..	..	..	..
Calculus	2	..	..	..	..	..	1	..	..	..	..
Hæmaturia	1	..	5	..	..	..	..	..	2	..	..
Incontinence of Urine	4	..	3	..	..	..	1	..	1	..	..
Retention „	..	..	2	..	..	..	..	..	..	..	..
Gonorrhœa	298	..	221	..	41	..	..	..	..	..	..
Phimosis, &c.	3	..	1	..	1	..	..	..	..	..	..
Bubo	6	..	3	..	..	..	..	..	..	..	..
Epididymitis, Gonorrhœal	10	..	3	..	2	..	..	..	..	..	..
Stricture of Urethra	16	..	10	..	..	..	2	..	1	..	..
Fistula in Perineo	2	..	..	..	..	..	..	..	..	..	..
Urinary Abscess	..	..	1	..	..	..	..	..	..	..	..
11. Generative System:											
Gangrene of Penis	..	..	..	..	1	1	..	..	..	..	..
Varicocele	..	..	4	..	..	..	..	1	..	..	..
Hydrocele	7	..	9	..	2	..	..	..	..	..	..
Orchitis	43	..	67	..	6	..	..	..	1	..	..
12. Organs of Locomotion:											
Ostitis	6	..	6	..	..	..	2	1	..	..	1
Caries	1	..	1	..	..	..	1	..	..	..	..
Necrosis	1	..	1	..	..	..	..	..	..	..	..
Tumours	4	..	2	..	..	..	..	..	..	..	1
Synovitis	7	..	6	..	..	..	2	2	..	..	..
Ankylosis	..	..	..	..	..	..	..	..	..	..	1
Lumbar Abscess	..	..	1	..	..	..	..	..	1	..	1
Deformity of Spine	1	..	..	..	..	..	1	1	..	..	..
Cyst of Muscle	1	..	..	..	..	..	..	..	..	..	..
Contraction of Tendons	..	..	1	..	..	..	..	..	1	..	..
Talipes equino valgus	..	..	2	..	..	..	..	1	1	..	..
Enlarged Bursa	..	..	1	..	..	..	..	..	..	..	..
Ganglion	1	..	..	..	..	..	..	..	..	..	..
13. Of Cellular Tissue:											
Inflam: of Cellular Tissue	18	..	14	..	..	..	..	..	..	..	..
Abscess „ „	33	..	127	1	34	..	1	..	..	1	..
Tumours	5	..	1	..	..	..	..	..	..	..	..
14. Cutaneous System:											
Erythema	5	..	2	..	..	..	..	..	..	..	..
Urticaria	2	..	2	..	..	..	..	..	..	..	..
Lichen	..	..	6	..	..	..	..	..	..	..	..
Psoriasis	5	..	15	..	..	..	..	..	..	..	..
Herpes	5	..	11	..	1	..	..	..	..	..	..
Pemphigus	2	..	1	..	..	..	..	..	..	..	..
Eczema	16	..	37	..	2	..	..	..	..	..	..
Impetigo	9	..	1	..	..	..	..	..	..	..	..
Rupia	1	..	..	..	..	..	..	..	..	..	..
Acne	3	..	1	..	..	..	..	..	..	..	..
Ulcer	49	..	93	..	21	..	1	..	1	..	1
Boil	121	..	132	..	17	..	..	..	..	..	..

Abstract No. 10—*continued.*

Stations	Gibraltar.		Malta.		Malta Fencible Artillery		Gibraltar.		Malta.		
Strength	4,066		4,855		592		Invalids.		Invalids.		
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Sent Home.	Discharged at Netley.	Sent Home.	Discharged at Malta.	Discharged at Netley.
Carbuncle	1	..	2	..	1	..	..	..	..	..	..
Whitlow	18	..	15	..	..	..	..	..	..	..	..
Corns	1	..	1	..	..	..	..	..	..	..	..
Warts	11	..	12	..	..	..	..	..	..	..	..
Ingrown Nail	5	..	7	..	2	..	..	..	..	..	..
Tinea	1	..	9	..	..	..	..	..	..	..	..
Itch	13	..	7	..	2	..	..	..	..	..	..
III. *Conditions, &c.*											
General Debility	12	..	69	..	1	..	11	8	4	..	5
Old Age	1	..	..	..	..	..	..	..	..	..	..
IV. *Poisons.*											
Alcoholic Poisoning	4	..	117	..	..	..	..	..	..	..	..
Delirium Tremens	5	..	14	..	..	..	..	..	..	..	..
V. *Injuries.*											
2. Accidental:											
Burns and Scalds	7	..	6	..	..	..	..	..	..	..	..
Multiple Injury	..	2	1	..	..	..	..	..	..	..	..
Asphyxia by Drowning	..	..	..	1	..	..	..	..	..	..	..
Contusion	167	..	222	..	5	..	1	..	1	..	1
Concussion of the Brain	..	..	1	..	..	..	1	..	..	..	..
Fracture	13	..	20	1	1	..	2	1	..	..	..
Wounds	110	..	121	..	2	..	..	..	1	..	..
Sprain	84	..	120	..	4	..	..	..	1	..	..
Dislocation	2	..	2	..	..	..	..	..	..	..	..
Blisters of the Feet	3	..	7	..	..	..	..	..	..	..	..
Bite	2	..	..	..	..	..	..	..	..	..	..
Needle in Foot	1	..	..	..	..	..	..	..	..	..	..
4. Self-inflicted:											
Cut-throat	1	1	4	..	..	..	..	..	..	..	1
VI. *Surgical Operations.*											
Amputation of Finger	..	..	1	1	..	..	..	..	..	..	..
,, Leg	..	..	1	..	..	..	..	..	..	..	..
Tracheotomy	..	..	..	..	..	..	..	..	..	..	1
No appreciable Disease	2	..	7	..	..	..	..	..	..	..	..
Total	2,595	19	4,505	41	468	5	148	92	75	11	56

Causes of the Deaths among the Invalids.

	From Gibraltar.	From Malta.
Phthisis Pulmonalis	1	2
Pneumonia	1	..
Valve Disease of Heart	..	1
Total	2	3

APPENDIX No. XV—*continued.*

ABSTRACT No. 11, showing the Ages of the Troops serving in the Mediterranean, and the Deaths at each Age, during the Year 1872.

Corps.	Under 20 Years.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.		Total.	
	Strength on 1st January.	Died.	Strength on 1st January.	Died.	Strength on 1st January.	Died.	Strength on 1st January.	Died.	Strength on 1st January.	Died.	Strength on 1st January.	Died.	Strength on 1st January.	Died.
Royal Artillery	217	2	558	5	292	6	404	3	203	2	31	..	1,705	18
Royal Engineers	11	..	101	..	154	..	106	..	81	..	14	..	467	..
1st Battalion 13th Regiment	27	..	192	1	180	4	133	2	68	..	8	..	608	7
1st „ 18th „	235	..	176	2	65	1	100	..	35	1	8	1	619	5
1st „ 24th „	43	..	245	..	155	..	108	1	50	..	5	..	606	1
28th Regiment	62	..	249	1	135	..	151	2	80	1	10	1	687	5
31st „	22	..	210	..	166	2	155	3	96	..	12	..	661	5
52nd „	24	..	287	2	146	..	95	1	78	2	6	..	636	5
71st „	54	..	220	2	119	..	139	..	73	1	10	1	615	4
74th „	26	1	238	1	189	2	87	1	66	1	7	..	613	6
81st „	93	..	212	..	96	3	95	..	97	1	4	..	602	4
Total	819	3	2,688	14	1,697	18	1,573	13	927	9	115	3	7,819	60

APPENDIX No. XV—*continued.*

ABSTRACT No. 12, showing the Admissions into Hospital and Deaths among the Troops serving in the Dominion of Canada and in Bermuda during the Year 1872; and the Number of Invalids sent home from these Colonies, and of Men finally discharged the Service in them and at Netley during the same period.

Stations	Dominion of Canada.		Bermuda.		Invalids.				
Average Annual Strength	1,602		1,770		Sent home from—		Discharged in Canada.	Discharged at Netley from—	
Diseases.	Admitted.	Died.	Admitted.	Died.	Canada.	Bermuda.		Canada.	Bermuda.
I. *General Diseases.*									
1. Febrile:									
Measles	4	..	..	..	..	..	..	..	..
Enteric Fever	..	..	2	..	..	..	..	..	..
Simple Continued Fever..	16	1	32	2	..	..	..	..	..
Febricula	8	..	24	..	..	..	..	..	..
Ague	10	..	4	..	..	..	..	..	..
Influenza	18	..	14	..	..	..	..	..	..
Erysipelas..	7	..	..	..	..	..	..	..	..
Pyæmia	..	..	1	..	..	..	..	..	..
2. Constitutional:									
Acute Rheumatism ..	17	..	12	..	..	..	..	..	..
Muscular „ ..	18	..	6	..	..	..	..	..	..
Chronic „ ..	14	..	26	..	1	2	2	2	..
Gout	1	..	..	..	..	..	..	..	..
Primary Syphilis	79	..	33	..	..	..	..	..	..
Secondary „	26	..	19	..	..	2	..	..	1
Lupus	1	..	..	..	..	..	..	..	..
Scrofula	4	..	1	..	..	..	..	..	1
Phthisis Pulmonalis ..	4	1	13	1	..	6	..	2	3
Hæmoptysis (Tubercular)	1	..	1	..	..	..	..	..	..
Anæmia	..	..	1	..	..	..	..	..	..
II. *Local Diseases.*									
1. Nervous System:									
Encephalitis	..	..	1	..	..	1	..	..	..
Sunstroke	..	..	3	1	..	..	..	..	..
Paralysis	..	..	4	..	1	2	..	1	..
Epilepsy	3	..	6	..	..	3	..	..	1
Convulsions	1	..	..	..	..	..	..	..	..
Spasm of Muscle	..	..	1	..	..	..	..	..	..
Neuralgia	8	..	2	..	..	..	..	..	..
Mania	2	..	..	..	..	..	..	..	..
Dementia	1	..	2	..	..	2	..	..	..
2. Diseases of the Eye:									
Conjunctivitis	13	..	22	..	..	..	..	..	..
Keratitis	1	..	..	..	..	..	..	..	..

Abstract No. 12—*continued.*

Stations	Dominion of Canada.		Bermuda.		Invalids.				
Average Annual Strength	1,602		1,770		Sent home from—		Discharged in Canada.	Discharged at Netley from—	
Diseases.	Admitted.	Died.	Admitted.	Died.	Canada.	Bermuda.		Canada.	Bermuda.
Ulcer of Cornea	1	..	..	..	..	..	..	..	..
Iritis	1	..	..	..	..	..	..	..	..
Amaurosis	..	..	1	..	..	1	..	..	1
Tarsal Ophthalmia	3	..	..	..	..	..	..	..	..
3. Diseases of the Ear:									
Inflam: of Extl. Meatus	1	..	..	..	..	..	..	..	..
Abscess	2	..	..	..	..	..	..	..	..
Deafness	..	..	2	..	..	..	..	..	..
4. Diseases of the Nose:									
Epistaxis	..	..	1	..	..	..	..	..	..
5. Circulatory System:									
Valve Disease of Heart	5	..	3	1	..	1	1	1	2
Hypertrophy „	1	1	4	..	..	3	..	1	..
Aneurism of Aorta	1	2	3	1	..	1	..	..	..
Palpitation „	3	..	..	..	..	..	..	1	..
Varicose Veins	..	..	2	..	..	1	..	..	..
6. Absorbent System:									
Inflam: of Glands	7	..	23	..	..	..	..	..	..
Suppuration „	4	..	2	..	..	..	..	..	..
8. Respiratory System:									
Coryza	..	..	1	..	..	..	..	..	..
Laryngitis	1	..	..	..	..	..	..	..	..
Bronchitis	102	..	41	..	1	..	..	..	..
Asthma	4	..	..	..	..	..	..	..	..
Pneumonia	10	2	3	1	..	..	..	..	1
Pulmonary Extravasation	..	..	..	1	..	..	..	..	..
Pleurisy	3	..	1	..	1	..	..	1	..
9. Digestive System:									
Ranula	1	..	..	..	..	..	..	..	..
Gum Boil	2	..	2	..	..	..	..	..	..
Sore Throat	1	..	..	..	..	..	..	..	..
Tonsillitis	38	..	21	..	..	..	..	..	..
Gastritis	1	..	..	..	..	..	..	..	..
Hæmatemesis	1	..	..	..	..	..	..	..	..
Dyspepsia	92	..	145	..	..	2	..	..	..
Gastrodynia	1	..	..	..	..	..	..	..	..
Dysentery	..	..	22	..	..	..	..	..	1
Hernia	2	..	1	..	1	1	..	2	..
Diarrhœa	11	..	75	..	..	..	..	..	..
Colic	8	..	3	..	..	..	..	..	..
Constipation	5	..	5	..	..	..	..	..	..

Abstract No. 12—*continued.*

Stations	Dominion of Canada.		Bermuda.		Invalids.				
Average Annual Strength.	1,602		1,770		Sent home from—		Discharged in Canada.	Discharged at Netley from—	
Diseases.	Admitted.	Died.	Admitted.	Died.	Canada.	Bermuda.		Canada.	Bermuda.
Fistula in Ano	2	..	3	..	..	..	..	..	..
Hæmorrhoids	11	..	7	..	..	..	..	..	..
Hepatitis	3	..	5	..	..	1	..	2	..
Simple enlargmnt. of Liver	2	..	..	..	..	..	..	..	..
Jaundice	1	..	5	..	..	..	..	..	..
10. Urinary System:									
Nephritis	..	..	2	..	..	..	..	..	..
Irritability of Bladder	1	..	..	..	..	..	..	..	..
Retention of Urine	..	..	1	..	..	..	..	..	..
Gonorrhœa	55	..	38	..	..	..	..	..	..
Phymosis, &c.	..	..	2	..	..	..	..	..	..
Bubo	..	..	1	..	..	..	..	..	..
Epididymitis, Gonorrhœal	2	..	..	..	..	..	..	..	..
Stricture of Urethra	6	..	3	..	..	..	..	..	..
11. Generative System:									
Inflam: of Penis	..	..	1	..	..	..	..	..	..
Varicocle	..	..	1	..	..	1	..	..	..
Orchitis	17	..	18	..	..	..	..	..	..
12. Organs of Locomotion:									
Ostitis	4	..	1	..	2	1	..	1	..
Synovitis	1	..	2	..	..	..	..	..	..
Malformation of Feet	1	..	..	..	..	..	..	..	..
Enlarged Bursa	..	..	1	..	..	..	..	..	..
Bunion	1	..	..	..	..	..	..	..	..
13. Diseases of Cellular Tissue:									
Inflam: of Cellular Tissue	5	..	20	..	..	..	..	..	..
Abscess „ „	23	..	45	..	..	2	..	..	..
14. Cutaneous System:									
Erythema	1	..	..	..	..	..	..	..	..
Psoriasis	..	..	1	..	..	..	..	..	..
Herpes	2	..	..	..	..	..	..	..	..
Eczema	4	..	33	..	..	..	..	..	..
Impetigo	..	..	1	..	..	..	..	..	..
Acne	1	..	..	..	..	..	..	..	..
Frost Bite	7	..	..	..	..	..	..	..	..
Ulcer	31	..	58	..	..	2	..	..	1
Boil	13	..	32	..	..	..	..	..	..
Carbuncle	1	..	..	..	..	..	..	..	..
Whitlow	5	..	1	..	..	..	..	..	..
Tumour	..	..	2	..	..	1	..	1	..
Warts	1	..	1	..	..	..	..	..	..
Ingrown Nail	1	..	..	..	..	..	..	..	..
Tinea	3	..	..	..	..	..	..	..	..

Abstract No. 12—*continued.*

Stations	Dominion of Canada.		Bermuda.		Invalids.				
Average Annual Strength	1,602		1,770		Sent home from—		Discharged in Canada.	Discharged at Netley from—	
Diseases.	Admitted.	Died.	Admitted.	Died.	Canada.	Bermuda.		Canada.	Bermuda.
III. *Conditions, &c.*									
General Debility	13	..	17	..	..	2	4	1	1
IV. *Poisons.*									
Alcoholic Poisoning ..	..	..	5	..	..	..	..	..	..
Delirium Tremens ..	6	..	15	1	..	..	..	..	..
V. *Injuries.*									
2. Accidental:									
Burns and Scalds	5	..	5	..	..	..	..	..	..
Asphyxia by Drowning ..	..	1	..	2	..	..	..	..	..
Contusion	47	..	85	..	..	..	..	..	..
Wounds	46	..	56	..	..	..	..	..	..
„ from Gunshot ..	2	..	..	..	..	..	..	..	..
Sprain	39	..	36	..	..	1	..	1	..
Dislocation	1	..	1	..	..	..	..	..	..
Blisters of the Feet ..	3	..	4	..	..	..	..	..	..
Fracture	5	..	9	..	..	..	..	..	..
4. Self-inflicted:									
Cut throat	..	..	2	2	..	..	..	..	..
No appreciable Disease ..	..	..	1	..	..	..	..	..	..
Total	941	8	1,112	13	7	39	7	17	13

APPENDIX No. XV—*continued.*

ABSTRACT No. 13, showing the Ages of the Troops serving in the Dominion of Canada and in Bermuda, and the Deaths at each Age, during the Year 1872.

	Corps.	Under 20.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.		Total.	
		Strength on 1st January.	Died.	Strength on 1st January.	Died.	Strength on 1st January.	Died.	Strength on 1st January.	Died.	Strength on 1st January.	Died.	Strength on 1st January.	Died.	Strength on 1st January.	Died.
Canada	Artillery	84	1	64	..	36	..	104	..	31	..	8	..	327	1
	Engineers	1	..	13	..	38	..	25	..	14	..	7	..	98	..
	1st Battalion 60th Foot	31	..	144	..	150	..	176	2	112	..	14	..	627	2
	Total	116	1	221	..	224	..	305	2	157	..	29	..	1,052	3
Bermuda	Artillery	74	..	18	1	28	..	50	..	44	1	5	..	219	2
	Engineers	12	..	69	..	104	..	66	..	58	..	4	1	313	1
	53rd Foot	183	..	192	1	153	1	73	4	7	..	4	..	612	6
	69th Foot	14	..	204	1	225	1	111	..	62	..	10	..	626	2
	Total	283	..	483	3	510	2	300	4	171	1	23	1	1,770	11

APPENDIX No. XV—*continued.*

ABSTRACT No. 14, showing the Admissions into Hospital, and Deaths, among the White Troops serving in the Windward and Leeward Command and Jamaica, in the Year 1872; the Disabilities of the Invalids sent home, and of those Discharged the Service at Netley during the same period.

Stations	Windward and Leeward Command.		Jamaica.		Invalids.	
Strength	658		354			
Diseases.	Admitted.	Died.	Admitted.	Died.	Sent Home.	Discharged at Netley.
I. General Diseases.						
1. Febrile:						
Enteric Fever	2	..	1	1	..	..
Simple Continued Fever ..	52	..	36	..	..	..
Febricula	3	..	4	..	..	..
Yellow Fever	..	..	4	1	..	..
Ague	9	..	6	..	1	..
Remittent Fever	7	..	1	..	..	..
Mumps	2	..	..	..	..	..
Influenza	2	..	..	..	..	..
Erysipelas	..	..	1	..	..	..
2. Constitutional:						
Acute Rheumatism	8	..	5	..	..	..
Muscular „	3	..	..	..	..	..
Chronic „	4	..	1	..	1	..
Primary Syphilis	43	..	9	..	..	..
Secondary „	7	..	3	..	..	..
Phthisis Pulmonalis	7	1	..	..	2	2
Tuberculosis	1	..	..	..	..	..
Hæmoptysis (Tub.)	2	..	1	1	..	..
Anæmia	4	..	1	..	..	..
Tumour	1	..	..	..	..	..
II. Local Diseases.						
1. Of the Nervous System:						
Meningitis	1	1	..	..	..	..
Paralysis	..	..	..	..	1	1
Neuralgia	2	..	..	..	..	..
Dementia	..	..	2	..	..	..
2. Of the Eye:						
Conjunctivitis	5	..	..	..	..	..
Catarrhal Ophthalmia ..	1	..	..	..	..	..
Ulcer of Cornea	1	..	..	..	..	..
Iritis	1	..	..	..	..	..
Inflammation of Eyelids ..	3	..	..	..	..	..
Hordeolum	1	..	..	..	..	..
3. Of the Ear:						
Inflam: Ext: Meatus ..	5	..	1	..	..	..
Abscess	..	..	1	..	..	..
Accumulation of Wax ..	..	..	1	..	..	..
Inflam: Membr: Tympani ..	1	..	..	..	..	..
Deafness	2	..	..	..	..	..
4. Of the Nose:						
Epistaxis	1	..	..	..	..	..

Abstract No. 14—*continued.*

Stations	Windward and Leeward Command.		Jamaica.		Invalids.	
Strength	658		354			
Diseases.	Admitted.	Died.	Admitted.	Died.	Sent Home.	Discharged at Netley.
5. Circulatory System:						
Valve Disease of Heart	2	..	..	..	..	..
Hypertrophy „	4	..	..	..	..	1
Angina Pectoris	1	..	..	..	1	..
Palpitation „	5	..	..	..	1	1
Aneurism of Aorta	1	..	..	..	1	1
Aneurism	1	..	1	1	..	..
Varicose Veins	..	..	1	..	..	..
6. Absorbent System:						
Inflammation of Glands	24	..	1	..	..	..
7. Of Ductless Glands:						
Goitre	1	..	..	..	..	..
8. Respiratory System:						
Bronchitis	13	..	4	..	..	..
Asthma	1	..	..	..	2	1
Pneumonia	1	..	1	..	..	..
Pleurisy	6	..	..	..	..	..
9. Digestive System:						
Stomatitis	1	..	1	..	..	..
Sore Throat	2	..	..	..	..	..
Tonsillitis	7	..	1	..	..	..
Dyspepsia	14	..	11	..	..	1
Hæmatemesis	1	..	..	..	..	..
Hernia	2	..	..	..	1	..
Diarrhœa	41	..	12	..	..	..
Colic	..	..	3	..	..	..
Constipation	1	..	..	..	..	..
Hæmorrhoids	5	..	1	..	..	..
Condyloma	1	..	..	..	..	..
Tænia Solium	1	..	1	..	..	..
Hepatitis	2	..	..	..	2	..
Abscess of Liver	..	..	1	..	..	..
Jaundice	2	..	..	..	..	..
Ascites	1	..	..	..	..	..
10. Urinary System:						
Bright's Disease	1	..	..	..	..	..
Incontinence of Urine	1	..	..	..	..	..
Gonorrhœa	79	..	15	..	..	..
Phimosis, &c.	2	..	6	..	..	..
Bubo	1	..	3	..	..	..
Epididymitis Gonorrhœal	1	..	..	..	..	..
Warts	..	..	1	..	..	..
Stricture of Urethra	4	..	..	..	..	..
11. Generative System:						
Œdema of Scrotum	2	..	..	..	..	..
Hydrocele	..	..	..	..	1	..
Orchitis	16	..	4	..	..	..

Abstract No. 14—*continued.*

Stations	Windward and Leeward Command.		Jamaica.		Invalids.	
Strength	658		354			
Diseases.	Admitted.	Died.	Admitted.	Died.	Sent Home.	Discharged at Netley.
12. Organs of Locomotion:						
Osseous Tumour	1	..	1	..	..	..
Relaxation of Ligament ..	..	..	..	..	..	1
Enlarged Bursa	1	..	..	..	..	..
Ganglion	..	..	1	..	..	..
13. Of Cellular Tissue:						
Inflam. Cellular Tissue ..	1	..	4	..	..	..
Abscess „ „ ..	7	..	5	..	..	..
Chigoe..	..	..	1	..	..	..
14. Cutaneous System:						
Erythema	1	..	..	..	..	..
Psoriasis	1	..	..	..	..	..
Herpes..	5	..	..	..	..	..
Eczema	8	..	..	..	..	..
Mentagra	1	..	..	..	..	..
Ulcer	25	..	10	..	1	..
Boil	13	..	6	..	..	..
Carbuncle	2	..	..	..	..	..
Whitlow	3	..	6	..	..	..
Ingrown Nail	..	..	1	..	..	..
Itch	1	..	..	..	..	..
III. *Conditions, &c.*						
General Debility	10	..	6	..	5	..
IV. *Poisons.*						
Alcohol	21	..	10	..	..	..
Delirium Tremens	2	1	1	..	..	..
V. *Injuries.*						
2. Accidental:						
Contusion	39	..	10	..	..	..
Fracture	1	..	4	1	..	..
Wounds	24	..	15	..	..	..
Sprain	22	..	10	..	..	..
Dislocation	2	..	..	..	..	..
Blisters of the Feet	2	..	1	..	..	..
Injury to Knee	1	..	..	..	..	..
„ Elbow	1	..	..	..	..	..
Total	624	3	288	5	20	9

CAUSES of Deaths of the Invalids.

	Windward and Leeward Command.
Phthisis Pulmonalis	1
Total	1

APPENDIX No. XV—*continued.*

ABSTRACT No. 15, showing the Admissions into Hospital, and Deaths, among the Black Troops serving in the Windward and Leeward Command, Jamaica, Honduras, Bahamas, and Western Africa, in the Year 1872, and the Disabilities of those Discharged the Service as Invalids during the same period, in the West Indies and Western Africa.

Stations	Windward and Leeward Command.		Jamaica.		Bahamas.		Honduras.		Western Africa.		Black Troops in West Indies and W. Africa.
Average Strength ..	635		499		145		193		378		1,850
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Discharged as Invalids.
I. *General Diseases.*											
1. Febrile:											
Cow Pox	1	..	..	..	..	..	..	..	..	..	..
Small Pox	..	..	..	..	..	..	..	..	1	..	..
Chicken Pox ..	2	..	..	..	..	..	..	..	..	..	
Simple Cont: Fever .	..	..	33	..	1	..	18	..	..	..	..
Febricula	5	..	4	..	..	..	..	..	..	..	..
Ague	83	..	28	..	13	..	11	..	238	1	..
Remittent Fever ..	4	..	5	..	3	..	48	..	46	2	..
Simple Cholera ..	..	..	..	..	..	..	1	..	..	..	..
Hooping Cough ..	..	..	1	..	..	..	..	..	..	..	..
Mumps	1	..	..	..	..	..	..	..	..	..	..
Influenza	..	..	..	..	1	..	2	..	..	..	..
2. Constitutional:											
Acute Rheumatism .	4	..	1	..	1	..	11	1	18	..	..
Muscular „ ..	21	..	2	..	1	..	7	..	3	..	..
Chronic „ ..	24	..	14	..	14	..	18	..	21	..	4
Gout	..	..	..	..	1	..	..	..	..	..	..
Primary Syphilis ..	45	..	34	..	41	..	2	..	30	..	5
Secondary „ ..	7	..	31	1	15	..	..	..	5	..	..
Lupus	..	..	..	..	..	..	..	..	1	..	..
Leprosy	1	..	..	..	..	..	..	..	..	..	1
Scrofula	..	..	4	..	..	..	1	..	..	..	3
Phthisis Pulmonalis	1	1	27	9	5	..	3	1	11	6	5
Tuberculosis ..	..	..	..	1	1	..	..	..	..	..	..
Hæmoptysis (Tub:) .	1	..	..	..	..	..	..	..	..	..	..
Anæmia	..	..	..	..	..	..	..	..	1	..	..
General Dropsy ..	..	..	1	..	..	..	..	..	..	..	..
II. *Local Diseases.*											
1. Nervous System.											
Meningitis	..	..	..	..	1	1	..	..	1	..	1
Apoplexy	..	..	..	..	..	..	..	..	1	1	..
Sunstroke	..	..	..	..	..	..	1	..	..	..	..
Paralysis	..	..	2	..	..	..	..	..	..	..	..
Tetanus	1	..	..	..	..	..	..	..	..	..	..
Epilepsy	..	..	2	..	..	..	..	..	1	..	1
Neuralgia	12	..	2	..	..	..	2	..	..	..	..
Anæsthesia ..	..	..	..	..	..	..	..	..	1	..	..
Mania	..	..	..	..	..	..	..	..	1	..	..
Dementia	1	..	2	..	..	..	..	..	..	..	3

Abstract No. 15—*continued.*

Stations	Windward and Leeward Command.		Jamaica.		Bahamas.		Honduras.		Western Africa.		Black Troops in West Indies and W. Africa.
Average Strength ..	635		499		145		193		378		1,850
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Discharged as Invalids.
2. Of the Eye:											
Conjunctivitis ..	6	..	10	..	2	..	4	..	4	..	..
Gon: Ophthalmia ..	1	..	..	..	..	..	..	..	..	..	..
Tarsal „ ..	6	..	..	..	..	..	..	..	..	..	..
Iritis	..	..	1	..	..	..	..	..	..	..	..
3. Of the Ear:											
Inflam: ext: Meatus:	..	..	..	..	1	..	..	..	..	..	..
Abscess	2	..	..	..	..	..	..	..	..	..	..
Deafness	3	..	..	..	..	..	..	..	..	..	..
4. Of the Nose:											
Ulcer: of Pituitary Membrane ..	..	..	..	..	..	..	..	..	1	..	..
Polypus	..	..	..	..	..	..	2	..	..	..	..
5. Circulatory Syst.											
Pericarditis.. ..	..	..	..	..	..	..	..	..	1	..	..
Valve Dis: of Heart	1	1	5	1	3	..	3	1	..	..	1
Hypertrophy „	..	..	..	..	2	..	..	..	1	..	..
Atrophy „	1	..	..	..	..	..	..	..	..	..	..
Fatty Degeneration of Heart	..	..	1	..	..	..	..	..	..	..	..
Palpitation of Heart	1	..	8	..	3	..	..	..	..	1	..
Aneurism of Aorta..	..	1	1	..	..	..	..	..	..	..	..
Varicose Veins ..	..	..	1	..	..	..	..	..	..	..	..
6. Absorbent Syst.											
Inflam: of Lymphatics	..	..	..	..	..	..	..	..	1	..	..
Inflam: of Glands..	22	..	4	..	..	..	6	..	3	..	..
Suppuration „	..	..	..	..	..	..	..	..	1	..	..
8. Respiratory Syst.:											
Bronchitis	31	..	18	..	18	..	5	..	21	1	..
Asthma	7	..	3	..	..	..	..	..	5	..	1
Pneumonia.. ..	6	1	4	2	..	..	2	1	3	1	..
Pul: Extravasation.	..	..	1	..	..	..	..	..	4	..	..
Pleurisy	2	..	1	..	..	..	1	..	..	..	..
9. Digestive Syst.:											
Hæmor: from Alveoli	..	..	..	..	2	..	..	..	..	..	..
Gum Boil	2	..	1	..	..	..	1	..	2	..	..
Sore Throat.. ..	..	..	..	..	1	..	..	..	1	..	..
Tonsillitis	13	..	3	..	1	..	5	..	3	..	..
Gastritis	2	..	..	..	..	..	..	..	..	..	..
Hæmatemesis ..	..	..	1	..	..	..	..	..	1	..	..
Dyspepsia	23	..	..	..	4	..	3	..	..	..	..
Gastrodynia ..	..	..	..	..	..	..	..	..	1	..	..
Enteritis	..	..	1	..	..	..	..	..	..	..	..
Dysentery	..	1	3	..	..	..	8	..	7	..	..
Hernia	5	..	1	..	2	..	..	..	4	..	4

Abstract No. 15—*continued.*

Stations	Windward and Leeward Command.		Jamaica.		Bahamas.		Honduras.		Western Africa.		Black Troops in West Indies and W. Africa.
Average Strength ..	635		499		145		193		378		1,850
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Discharged as Invalids.
Diarrhœa	33	..	17	..	..	..	9	..	19	2	..
Colic	3	..	1	..	..	..	4	..	1	..	..
Constipation ..	3	..	..	..	..	..	6	..	..	..	..
Hæmorrhoids ..	1	..	..	..	..	..	..	..	1	..	..
Prolapsus Ani ..	1	..	..	..	..	..	..	..	..	..	..
Hepatitis	1	..	..	..	1	..	3	..	..	..	..
Abscess of Liver ..	1	1	..	..	..	..	..	..	..	..	..
Tænia Solium ..	..	..	..	..	1	..	..	..	2	..	..
Jaundice	..	..	..	..	2	..	..	..	1	..	..
Splenitis	1	..	1	..	..	..	1	..	2	..	..
Peritonitis	..	..	1	..	..	..	..	..	..	..	..
10. Urinary System:											
Nephritis	..	..	..	..	..	..	1	..	..	..	..
Cystitis	..	..	..	..	..	..	..	..	1	..	..
Hæmaturia	..	..	..	..	..	..	..	..	1	..	..
Gonorrhœa	85	..	46	..	18	..	27	..	35	..	..
Phimosis, &c. ..	2	..	1	..	..	..	..	..	2	..	..
Bubo	3	..	9	..	2	..	..	..	9	..	..
Epididymitis (Gon.)	6	..	1	..	1	..	..	..	..	..	..
Stricture of Urethra	2	..	..	..	1	..	1	..	..	..	..
11. Generative Syst.:											
Œdema of Scrotum .	..	..	..	..	..	..	..	..	1	..	..
Varicocele	..	..	..	..	1	..	..	..	..	..	..
Orchitis	21	..	7	..	1	..	3	..	10	..	..
12. Organs of Locomotion:											
Ostitis	..	..	1	..	1	..	..	..	2	..	..
Caries	..	..	..	..	..	..	..	..	1	..	..
Necrosis	..	..	..	..	..	..	..	..	1	..	..
Acute Synovitis ..	1	..	5	..	2	..	..	..	1	..	..
Enlarged Bursa ..	..	..	1	..	..	..	1	..	..	..	..
Bunion	..	..	..	..	..	..	1	..	..	..	..
13. Of Cellular Tissue:											
Inflam: of Cel: Tissue	1	..	..	..	..	..	..	..	1	..	..
Abscess „ „	2	..	7	..	3	..	7	..	7	..	..
Guinea Worm ..	..	..	..	..	..	..	..	..	2	..	..
14. Cutaneous Syst.:											
Erythema	..	..	4	..	..	..	..	..	..	..	..
Prurigo	..	..	..	..	..	..	..	..	1	..	..
Psoriasis	..	..	..	..	..	..	2	..	1	..	..
Herpes	1	..	1	..	1	..	..	..	..	..	..
Eczema	1	..	2	..	..	..	5	..	1	..	..
Impetigo	..	..	..	..	..	..	4	..	..	..	..
Ecthyma	..	..	..	..	..	..	..	..	1	..	..

Abstract No. 15—*continued.*

Stations	Windward and Leeward Command.		Jamaica.		Bahamas.		Honduras.		Western Africa.		Black Troops in West Indies and W. Africa.
Average Strength ..	635		499		145		193		378		1,850
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Discharged as Invalids.
Ulcer	16	..	25	..	4	..	9	..	33	..	1
Boil	12	..	6	..	1	..	1	..	8	..	..
Carbuncle	..	..	..	..	..	..	1	..	..	..	..
Whitlow	1	..	1	..	2	..	1	..	2	..	..
Warts	..	..	1	..	..	..	..	..	..	..	..
Ingrown Nail ..	..	..	..	..	..	..	..	..	1	..	..
Tinea	1	..	..	..	..	..	..	..	..	..	..
Itch	1	..	..	..	..	..	..	..	..	..	..
Fissures	..	..	..	..	..	..	..	..	1	..	..
III. *Conditions, &c.*											
General Debility ..	3	..	9	..	..	..	3	..	1	..	..
IV. *Poisons, &c.*											
Delirium Tremens ..	1	..	1	..	..	..	..	..	1	..	..
Narcotic	..	..	1	..	..	..	..	..	..	..	..
By Animal Matter ..	..	..	..	..	1	..	..	..	..	..	..
Bite of Insect ..	..	..	..	..	..	..	1	..	..	..	..
V. *Injuries.*											
1. Battle:											
Gunshot	..	..	..	..	..	..	13	2	..	..	..
2. Accidental:											
Burns and Scalds ..	4	..	1	..	..	..	..	..	1	..	..
Multiple Injury ..	..	..	1	..	..	..	..	..	..	..	..
Contusion	32	..	11	..	2	..	5	..	1	..	..
Fracture	..	..	4	..	..	..	..	..	..	..	..
Wounds	25	..	24	..	15	..	11	..	6	..	..
„ from Gunshot .	..	..	2	..	..	..	..	..	..	..	..
Sprain	13	..	7	..	4	..	2	..	5	..	..
Dislocation	..	..	..	..	..	..	..	..	2	..	..
Blisters of the Feet .	17	..	3	..	1	..	..	..	1	..	..
4. Suicide:											
Gunshot	..	..	..	1	..	..	..	..	..	..	..
VI. *Surgical Operations*											
Amputation of Finger	..	..	1	..	..	..	..	..	..	..	..
„ Arm ..	..	..	..	..	..	..	..	..	1	..	..
„ Leg ..	..	..	..	..	..	..	..	..	1	..	..
„ at Ankle joint	..	..	2	..	..	..	..	..	..	..	..
Circumcision ..	..	..	3	..	..	..	..	..	..	..	..
Total	643	6	519	15	202	1	287	6	629	15	30

APPENDIX No. XV.—*continued.*

ABSTRACT No. 16, showing the Admissions into Hospital, and Deaths, among the Troops serving at the Cape of Good Hope and St. Helena, Mauritius, and Ceylon, in the year 1872.

Stations	Cape and St. Helena.		Mauritius.		Ceylon.			
					White.		Black.	
Strength	2,484		469		1,001		862	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
I. *General Diseases.*								
1. Febrile:								
Small Pox	..	..	..	..	..	..	5	..
Cowpox	..	..	..	..	..	..	1	..
Chicken Pox	..	..	..	..	..	..	5	..
Scarlet Fever	3	..	..	..	..	..	..	..
Enteric „	1	..	1	..	..	2	..	..
Simple continued Fever	22	..	..	..	13	..	..	..
Febricula	34	..	18	..	19	..	..	..
Ague	40	..	363	..	38	..	141	..
Remittent Fever	103	3	5	1	40	3	3	1
Simple Cholera	..	..	1	..	..	..	..	..
Mumps	4	..	..	..	2	..	..	..
Influenza	91	..	2	..	12	..	..	..
Erysipelas	7	..	..	..	1	..	..	..
2. Constitutional:								
Acute Rheumatism	12	..	1	..	4	..	14	..
Gonorrhœal „	2	..	..	..	..	..	..	..
Muscular „	19	..	9	..	15	..	..	..
Chronic „	35	..	5	..	9	..	5	..
Primary Syphilis	272	..	18	..	58	..	6	1
Secondary „	75	..	9	..	21	..	1	..
Lupus	3	..	..	..	..	..	..	..
Phthisis Pulmonalis	23	3	3	1	8	2	7	3
Hæmoptysis (Tubercular)	1	..	..	..	..	..	..	..
Purpura	1	..	..	..	..	..	..	..
Scurvy	..	..	1	..	..	..	..	..
Anæmia	1	..	2	..	6	..	..	..
General Dropsy	..	..	..	..	2	1	..	..
II. *Local Diseases.*								
1. Diseases of the Nervous System:								
Meningitis	3	..	..	..	..	..	..	..
Apoplexy	2	1	..	..	..	..	..	..
Sunstroke	..	..	..	..	2	1	..	..
Fibrous Tumour of Brain	..	1	..	..	..	..	..	..
Paralysis	1	..	1	..	3	..	..	..
Tetanus	..	..	..	..	..	..	1	1
Epilepsy	5	..	4	..	2	..	..	..
Convulsions	..	..	..	..	1	..	..	..
Neuralgia	4	..	..	..	2	..	..	..
Ansæthesia	..	..	..	..	1	..	..	..
Mania	..	..	..	..	1	..	..	..
Dementia	5	..	..	..	..	..	..	..

Abstract No. 16—*continued.*

Stations..	Cape and St. Helena.		Mauritius.		Ceylon. White.		Ceylon. Black.	
Strength	2,484		469		1,001		862	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
2. Diseases of the Eye:								
Conjunctivitis	55	..	2	..	22	..	64	..
Purulent Ophthalmia	..	..	..	..	1	..	..	..
Keratitis	2	..	1	..	1	..	..	..
Ulcer of Cornea	..	..	..	..	1	..	..	..
Opacity	2	..	..	..	..	..	..	..
Sclerotitis	..	..	..	..	1	..	..	..
Iritis	3	..	..	..	1	..	..	..
Amaurosis	1	..	2	..	..	..	..	..
Impaired Vision	5	..	..	..	..	..	..	..
Hemeralopia	..	..	..	..	1	..	..	..
Inflammation of Eyelid	1	..	..	..	..	..	..	..
Hordeolum	3	..	..	..	1	..	1	..
Tarsal Ophthalmia	17	..	..	..	..	..	..	..
3. Diseases of the Ear:								
Inflammation of External Ear	4	..	1	..	9	..	2	..
Abscess	1	..	1	..	..	..	..	..
Accumulation of Wax	..	..	1	..	..	..	..	..
Tumour	3	..	..	..	..	..	..	..
Inflamm : Membr : Tympani	4	..	6	..	..	..	1	..
Deafness	4	..	..	..	..	..	..	..
5. Circulatory System:								
Valve Disease of Heart	9	2	..	..	6	1	1	..
Mitral Valve Disease	2	..	..	..	..	..	..	..
Hypertrophy of Heart	1	..	..	..	..	..	..	..
Angina Pectoris	1	..	..	..	..	..	..	..
Palpitation	6	..	1	..	4	..	..	..
Varicose Veins	1	..	..	..	2	..	..	..
6. Absorbent System:								
Inflammation of Lymphatics	..	..	1	..	..	..	..	..
Inflammation of Glands	59	..	8	..	44	..	7	..
Suppuration „	7	..	..	..	13	..	..	..
8. Respiratory System:								
Coryza	..	..	..	..	2	..	..	..
Laryngitis	2	1	..	..	..	..	..	..
Aphonia	1	..	..	..	..	..	..	..
Bronchitis	51	..	10	..	27	..	18	..
Asthma	4	..	..	..	1	..	..	..
Pneumonia	10	1	1	..	1	1	3	..
Passive Congestion of Lungs	1	1	..	..	..	..	..	..
Emphysema	3	..	..	..	..	..	..	..
Pleurisy	1	..	..	..	3	..	..	..
9. Digestive System:								
Stomatitis	3	..	..	..	..	..	1	..
Gum Boil	7	..	3	..	2	..	1	..
Glossitis	..	..	..	..	2	..	..	..
Relaxed Throat	..	..	1	..	..	..	..	..
Tonsillitis	71	..	3	..	6	..	1	..
Abscess of Pharynx	2	..	..	..	..	..	..	..

Abstract No. 16—*continued.*

Stations..	Cape and St. Helena.		Mauritius.		Ceylon. White.		Ceylon. Black.	
Strength	2,484		469		1,001		862	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Gastritis	1	..	..	..	..	..	..	..
Dyspepsia	134	..	20	..	31	..	2	..
Typhlitis	..	..	..	..	1	..	..	..
Dysentery	16	..	6	..	81	5	12	2
Melæna..	1	..	..	..	..	..	..	..
Hernia ..	1	..	..	..	1	..	3	..
Diarrhœa	81	1	23	..	68	..	12	1
Colic	17	..	3	..	4	..	2	..
Constipation	7	..	1	..	3	..	..	..
Fistula in Ano..	..	..	..	..	3	..	..	..
Hæmorrhoids ..	12	..	5	..	2	..	2	..
Prolapsus of Anus	..	..	..	..	1	..	..	..
Condyloma	10	..	..	..	..	..	..	..
Tænia Solium ..	14	..	4	..	2	..	..	..
Hepatitis	23	1	4	..	40	5	2	..
Congestion of Liver	10	..	..	..	2	..	..	..
Jaundice	10	..	2	..	3	..	..	..
Splenitis	1	..	1	..	..	..	..	..
Congestion of Spleen	3	..	..	..	..	..	..	..
Tumour	1	..	..	..	..	..	..	..
10. Urinary System:								
Bright's Disease	..	..	..	..	8	..	..	..
Cystitis..	2	..	..	..	..	..	..	..
Calculus	1	..	..	..	..	..	..	..
Gonorrhœa	351	..	25	..	84	..	7	..
Phimosis, &c.	4	..	1	..	..	..	..	..
Bubo	2	..	..	..	1	..	..	..
Epididymitis (Gon:)	13	..	1	..	1	..	..	..
Warts	2	..	..	..	..	..	..	..
Stricture of Urethra	13	..	..	..	11	..	..	..
Hæmorrhage from Urethra	..	..	..	..	2	..	..	..
11. Generative System:								
Hydrocele	5	..	..	..	4	..	1	..
Orchitis	39	..	5	..	22	..	5	..
12. Organs of Locomotion:								
Ostitis	4	..	1	..	..	..	1	..
Caries	3	..	..	..	..	..	..	..
Necrosis	1	..	..	..	..	..	..	..
Synovitis	5	..	..	..	2	..	..	..
Loose Cartilage	..	..	..	..	2	..	..	..
Atrophy of Muscle	1	..	..	..	..	..	..	..
Bunion ..	1	..	..	..	..	..	..	..
13. Diseases of Cellular Tissue:								
Inflammation of Cellular Tissue	14	..	..	..	1	..	5	..
Abscess „ „	34	..	8	..	20	..	9	..
14. Cutaneous System:								
Urticaria	2	..	..	..	..	..	1	..
Psoriasis	2	..	1	..	1	..	1	..

Abstract No. 16—*continued.*

Stations	Cape and St. Helena.		Mauritius.		Ceylon. White.		Ceylon. Black.	
Strength	2,484		469		1,001		862	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Herpes	7	..	1	..	1	..	1	..
Pemphigus	1	..	..	..	..	..	..	..
Eczema	11	..	..	..	2	..	3	..
Impetigo	1	..	..	..	1	..	..	..
Ulcer	112	..	14	..	36	..	55	..
Boil	48	..	13	..	17	..	15	..
Carbuncle	1	..	..	..	..	..	..	..
Whitlow	17	..	1	..	5	..	4	..
Corn	3	..	..	..	1	..	..	..
Tumour	3	..	..	..	..	..	1	..
Warts	11	..	..	..	3	..	..	..
Ingrown Nail	..	..	3	..	..	..	..	..
Tinea	4	..	..	..	..	..	..	..
Itch	1	..	..	..	1	..	7	..
III. *Conditions, &c.*								
General Debility	16	1	6	..	8	..	3	..
IV. *Poisons.*								
Delirium Tremens	13	..	5	..	1	..	..	..
Alcohol	9	..	1	..	20	..	..	..
Snake Bite	..	..	..	..	1	..	1	..
V. *Injuries.*								
2. Accidental:								
Burns and Scalds	8	..	..	..	2	..	1	..
Asphyxia by Drowning	..	3	..	..	..	..	..	..
Contusion	87	..	22	..	41	..	16	..
Concussion of the Brain	1	..	..	..	..	..	..	..
Fracture	8	..	2	..	1	..	..	..
Wounds	67	..	21	..	42	..	41	..
Sprain	74	..	5	..	19	..	7	..
Dislocation	1	..	2	..	2	..	..	..
Blisters of the Feet	16	..	2	..	8	..	2	..
Rupture of Tendons	1	..	..	..	..	..	..	..
Bite of Dog	..	..	1	..	..	..	..	..
4. Self-inflicted:								
Gunshot	1	..	..	..	..	1	..	..
Cut Throat	..	..	..	..	1	..	..	..
VI. *Surgical Operations.*								
For Phimosis	1	..	..	..	..	..	..	..
No appreciable Disease	4	..	..	..	1	..	..	..
Totals	2,479	19	695	2	1026	22	511	9

NOTE.—Causes of deaths of Invalids, *see* end of Abstract No. 17.

APPENDIX No. XV—*continued.*

ABSTRACT No. 17, showing the Number of Men sent home from the Cape of Good Hope and St. Helena, Mauritius, and Ceylon, in 1872, as Invalids, and of Invalids finally discharged the Service in these Colonies and at Netley.

Diseases.	Invalids.						
	Sent Home from			Discharged at Netley from			Asiatic Troops discharged in Ceylon.
	Cape and St. Helena.	Mauritius.	Ceylon. White.	Cape and St. Helena.	Mauritius.	Ceylon.	
I. *General Diseases.*							
1. Frebrile:							
Ague	..	5	..	..	1	..	..
2. Constitutional:							
Chronic Rheumatism.. ..	3	..	..	4	..	..	..
Muscular „	1	1	..	..	..	..	..
Primary Syphilis	1	..	..	..	..	..	..
Secondary „	5	..	1	..	..	..	..
Scrofula	..	..	..	2	..	..	..
Phthisis-Pulmonalis	8	2	..	7	..	3	..
Anæmia	..	1	..	1	1	..	..
Gonorrhœal Rheumatism ..	1	..	..	..	..	..	..
II. *Local Diseases.*							
1. Diseases of the Nervous System:							
Apoplexy	1	..	..	..	..	..	..
Paralysis	..	..	..	1	..	1	..
Epilepsy	..	1	..	..	..	..	..
Neuralgia	1	..	..	..	..		..
Softening of Brain	1	..	..	..	..		..
2. Diseases of the Eye:							
Conjunctivitis	1	..	..	..	..	..	..
Tarsal Ophthalmia	..	..	..	3	..	..	..
Impaired Vision	3	..	..	1	1	1	..
Keratitis	..	1	..	..	..	..	..
5. Circulatory System:							
Valve Disease of Heart ..	4	..	..	3	..	2	..
Hypertrophy „ ..	..	..	..	1	..	1	..
Aneurism	..	..	..	..	..	1	..
8. Respiratory System:							
Bronchitis	2	..	..	..	..	..	..
Pneumonia	2	..	..	..	..	..	..
9. Digestive System:							
Dyspepsia	..	1	..	..	..	..	..
Dysentery	..	1	..	..	..	..	..
Diarrhœa	1	..	1	..	..	..	..
Hernia	..	..	..	1	..	1	..
Hepatitis	3	1	2	3	..	1	..
Caries of Jaw	1	..	..	..	..	..	..
Congestion of Liver	1	..	..	..	..	..	..
Stricture of Œsophagus ..	..	1	..	..	1	..	..

Abstract No. 17—*continued.*

Diseases.	Invalids.						
	Sent Home from			Discharged at Netley from			Asiatic Troops discharged in Ceylon.
	Cape and St. Helena.	Mauritius.	Ceylon. White.	Cape and St. Helena.	Mauritius.	Ceylon.	
10. Urinary System:							
Bright's Disease	..	..	1	..	..	2	..
Stricture of Urethra	1	..	..	..	..	..	..
12. Organs of Locomotion:							
Caries	..	..	..	1	..	..	..
Necrosis	..	..	..	1	..	..	..
Contraction	..	..	..	1	..	..	..
Atrophy of Muscles	1	..	..	..	..	..	..
14. Cutaneous System:							
Ulcer	1	1	..	1	..	..	..
Sycosis..	1	..	..	..	..	..	..
III. *Conditions, &c.*							
General Debility	3	..	..	..	1	1	7
V. *Injuries.*							
2. Accidental:							
Contusion	1	..	..	..	..	..	..
Fracture	1	..	..	1	..	1	..
VI. *Surgical Operations.*							
Amputation of Arm	..	..	..	..	1	..	..
Total	49	16	5	32	6	15	7

Causes of the Deaths of Invalids.

	Cape and St. Helena.	Mauritius.	Ceylon. White.	China.	Straits Settlement.
Secondary Syphilis ..	..	..	1	..	..
Phthisis Pulmonalis ..	2	..	..	..	..
Aneurism of Aorta ..	..	1	..	..	1
Dysentery and Diarrhœa..	1	..	2	..	..
Cirrhosis of Liver ..	..	..	..	1	..
Stricture of Urethra ..	1	..	..	..	..
Total	4	1	3	1	1

APPENDIX No. XV—*continued.*

ABSTRACT No. 18, showing the Admissions into Hospital, and Deaths, among the Troops serving in China and the Straits Settlements in 1872, and the Number of Men sent Home as Invalids, and of those finally Discharged the Service at Netley.

Stations	China.				Straits Settlements.				China and Straits Settlements. European Troops.	
	White.		Asiatic.		White.		Asiatic.			
Strength	769		354		708		222		1,477	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Sent Home as Invalids.	Discharged at Netley.
I. *General Diseases.*										
1. Febrile:										
Small Pox	..	..	20	..	1	..	1	1	..	..
Cow Pox	..	..	..	..	..	..	1	..	..	..
Chicken Pox	..	..	5	..	..	..	1	..	..	..
Enteric Fever	4	2	..	..	1	..	..	..	..	..
Simple continued Fever ..	16	..	..	..	73	6	1	..	..	..
Febricula	204	..	4	..	60	..	1	..	..	..
Ague	358	..	51	..	660	..	63	..	..	..
Remittent Fever	37	..	4	..	14	1	2	..	..	..
Influenza	2	..	..	..	3	..	5	..	..	..
Erysipelas	..	..	..	..	1	..	..	..	..	..
2. Constitutional:										
Acute Rheumatism	3	..	..	..	8	..	1	..	..	..
Muscular „	32	..	..	..	5	..	..	..	..	..
Chronic „	3	..	8	..	11	..	54	..	..	..
Primary Syphilis	31	..	8	..	57	..	..	..	..	..
Secondary „	22	..	3	..	10	..	7	..	3	2
Lupus	..	..	..	..	..	..	1	..	..	..
Scrofula	..	..	..	..	1	..	..	..	1	..
Phthisis Pulmonalis	2	..	2	..	10	..	..	..	7	5
Scurvy	..	..	..	..	1	..	..	..	..	..
Anæmia	4	..	..	..	3	..	4	1	..	..
General Dropsy	3	1	1	1	3	..	1	..	..	..
Beri-beri	..	..	..	..	1	..	..	..	..	..
II. *Local Diseases.*										
1. Diseases of the Nervous System:										
Encephalitis	..	..	..	..	1	..	..	..	1	..
Abscess of Cerebellum	1	1	..	..	..	..	..	..	..	..
Apoplexy	1	1	..	..	2	1	1	1	..	..
Sunstroke	1	1	..	..	..	..	..	..	..	..
Paralysis	..	..	..	..	1	..	..	..	..	1
Tetanus	..	..	..	..	1	1	1	1	..	..
Epilepsy	..	..	..	..	6	..	..	..	2	2
Neuralgia	2	..	..	..	6	..	1	..	..	..
Sciatica	1	..	..	..	1	..	..	..	..	..
Hypochondriasis	..	..	..	..	1	..	..	..	..	..
Mania	1	..	..	..	1	..	2	..	..	..
Dementia	..	..	1	..	3	..	..	..	4	..

Abstract No. 18—*continued.*

Stations	China.				Straits Settlements.				China and Straits Settlements. European Troops.	
	White.		Asiatic.		White.		Asiatic.			
Strength	769		354		708		222		1,477	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Sent Home as Invalids.	Discharged at Netley.
2. Diseases of the Eye:										
Conjunctivitis	10	..	..	..	14	..	19	..	..	..
Gonorrhœal Ophthalmia	1	..	..	..	..	..	..	..	..	..
Keratitis	1	..	..	..	..	..	..	..	..	..
Ulcer of Cornea	1	..	..	..	..	..	..	..	1	1
Conical Cornea	1	..	..	..	..	..	..	..	..	..
Iritis	1	..	..	..	1	..	..	..	..	..
Retinitis	1	..	..	..	..	..	..	..	..	..
Cataract	3	..	..	..	..	..	..	..	..	..
Tarsal Ophthalmia	1	..	..	..	..	..	..	..	..	..
3. Diseases of the Ear:										
Inflam: Membr: Tympani	4	..	..	..	3	..	1	..	..	..
Deafness	1	..	..	..	7	..	..	..	..	..
Polypus	1	..	..	..	..	..	..	..	..	..
Inflam: External Meatus	4	..	1	..	1	..	..	..	..	..
5. Circulatory System:										
Pericarditis	..	..	..	..	1	..	..	..	..	..
Palpitation	16	..	..	..	5	..	..	..	2	1
Valve Disease of Heart	1	..	1	1	2	..	..	..	..	2
Atrophy of Heart	..	..	1	1	..	..	..	..	..	..
Angina Pectoris	..	..	..	..	1	..	..	..	..	..
Syncope	1	..	..	..	..	..	..	..	..	..
Aneurism of Aorta	1	1	..	1	2	1	..	..	1	1
Varicose Veins	3	..	..	..	..	..	1	..	..	1
6. Absorbent System:										
Inflammation of Glands	4	..	1	..	15	..	..	..	1	..
Suppuration „	1	..	..	..	2	..	..	..	..	..
Hypertrophy „	..	..	1	..	..	..	..	..	..	..
8. Respiratory System:										
Coryza	1	..	..	..	..	..	..	..	..	..
Bronchitis	27	..	15	..	32	..	6	..	3	..
Asthma	..	..	6	..	..	..	1	..	..	..
Pneumonia	3	..	3	..	5	1	..	..	1	..
Pleurisy	8	1	..	..	4	..	4	..	..	1
9. Digestive System:										
Alveolar Necrosis	1	..	..	..	..	..	..	..	..	..
Inflammation of Alveolus	1	..	..	..	..	..	..	..	..	..
Sore Throat	..	..	..	..	4	..	..	..	..	..
Ulcerated Throat	1	..	..	..	..	..	..	..	..	..
Tonsillitis	4	..	..	..	9	..	2	..	..	..
Gastritis	..	..	..	..	1	1	..	..	..	..
Dyspepsia	23	..	2	..	39	..	35	..	1	..
Dysentery	14	..	1	..	9	1	14	..	1	1
Diarrhœa	106	..	22	1	76	2	29	..	2	..
Hernia	3	..	..	..	1	..	..	..	..	..
Colic	19	..	..	..	2	..	10	..	..	..

Abstract No. 18—*continued.*

Stations	China.				Straits Settlements.				China and Straits Settlements. European Troops.	
	White.		Asiatic.		White.		Asiatic.			
Strength	769		354		708		222		1,477	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Sent Home as Invalids.	Discharged at Netley.
Constipation	15	..	..	..	..	..	..	..	..	..
Fistula in Ano	3	..	..	..	..	..	..	..	..	..
Hæmorrhoids	3	..	1	..	4	..	..	..	8	..
Condyloma	1	..	..	..	..	..	..	..	..	..
Tænia Solium	..	..	..	..	1	..	..	..	..	..
Ascaris Lumbricoides	..	..	..	..	1	..	..	..	..	..
Oxyuris Vermicularis	1	..	..	..	..	..	..	..	..	..
Hepatitis	15	1	..	..	26	..	..	..	..	3
Abscess of Liver	1	1	..	..	1	1	..	..	1	..
Congestion of Liver	7	..	..	..	1	..	..	..	1	1
Cirrhosis	2	..	..	..	..	..	..	..	2	..
Jaundice	2	..	..	..	2	..	1	..	..	..
Splenitis	2	..	..	..	..	..	1	1	..	..
Congestion of Spleen	1	..	..	..	..	..	..	..	..	..
Peritonitis	..	..	..	1	..	..	..	..	..	..
Ascites	1	..	..	..	..	..	..	..	..	..
10. Urinary System:										
Bright's Disease	2	..	..	..	1	..	..	..	1	..
Nephritis	1	1	..	..	..	..	..	..	..	..
Hæmaturia	1	..	..	..	..	..	..	..	..	..
Incontinence of Urine	2	..	..	..	..	..	..	..	..	..
Retention of Urine	1	..	..	..	..	..	..	..	..	..
Gonorrhœa	94	..	25	..	64	..	3	..	..	..
Phimosis, &c.	3	..	2	..	2	..	..	..	..	..
[illegible]	2	..	..	..	3	..	..	..	..	..
Epididymitis Gon.	4	..	..	..	3	..	..	..	..	..
Stricture of Urethra	7	..	1	..	4	..	..	..	..	..
11. Generative System:										
Hydrocele	1	..	..	..	2	..	1	..	..	..
Orchitis	20	..	3	..	6	..	3	..	..	..
Fungus Testis	..	..	..	..	1	..	..	..	..	..
Spermatorrhœa	1	..	..	..	..	..	..	..	..	..
Inflammation of Mammilla	..	..	..	..	1	..	..	..	..	..
12. Organs of Locomotion:										
Ostitis	..	..	..	..	1	..	..	..	..	..
Necrosis	..	..	..	..	1	..	..	..	..	..
Synovitis	2	..	..	..	..	..	..	..	..	..
Ankylosis of Hip	..	..	..	..	1	..	..	..	1	..
Psoas Abscess	..	..	..	..	1	..	..	..	1	..
Atrophy of Muscle	1	..	..	..	..	..	..	..	..	..
Contraction of Tendons	1	..	..	..	..	..	..	..	..	..
Bursal Tumour	..	..	..	..	1	..	..	..	..	..
Enlarged Bursa Patella	1	..	..	..	..	..	..	..	..	..
Œdema of Legs	2	..	..	..	..	..	..	..	..	..

Abstract No. 18—*continued.*

Stations	China.				Straits Settlements.				China and Straits Settlements. European Troops.	
	White.		Asiatic.		White.		Asiatic.			
Strength	769		354		708		222		1,477	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Sent Home as Invalids.	Discharged at Netley.
13. Diseases of Cellular Tis:										
Inflam: of Cellular Tissue	4	..	..	..	..	..	..	..	..	..
Abscess „ „	28	..	9	..	41	..	3	..	1	..
Œdema of Face	2	..	..	..	..	..	..	..	..	..
14. Cutaneous System:										
Erythema	1	..	..	..	1	..	..	..	..	..
Urticaria	1	..	..	..	..	..	..	..	..	..
Psoriasis	1	..	1	..	..	..	1	..	..	..
Herpes	..	..	1	..	..	..	1	..	..	..
Pemphigus	..	..	..	..	48	..	..	..	..	..
Eczema	2	..	1	..	5	..	..	..	..	..
Ulcer	21	..	10	..	71	..	25	..	1	1
Boil	26	..	2	..	16	..	18	..	..	..
Carbuncle	2	..	..	..	..	..	..	..	..	..
Whitlow	4	..	2	..	4	..	..	..	..	..
Corn	..	..	..	..	..	..	1	..	..	..
Fatty Tumour	1	..	..	..	..	..	..	..	..	..
Warts	..	..	1	..	5	..	1	..	..	..
Ingrown Nails	..	..	..	..	1	..	..	..	..	..
Tinea	23	..	..	..	5	..	..	..	..	..
Itch	3	..	22	..	..	..	4	..	..	..
Chilblains	..	..	1	..	..	..	..	..	..	..
III. *Conditions, &c.*										
General Debility	31	..	7	..	4	..	6	1	4	2
IV. *Poisons.*										
Alcoholic Poisoning	1	..	..	..	..	..	..	..	..	..
Delirium Tremens	16	1	..	..	10	1	..	..	..	..
By Opium	..	..	..	..	..	..	1	..	..	..
V. *Injuries.*										
2. Accidental:										
Burns and Scalds	1	..	1	..	1	..	1	..	..	..
Asphyxia by Drowning	..	..	..	..	..	2	..	..	..	..
Contusion	33	..	10	..	24	..	4	..	..	..
Concussion of the Brain	1	..	..	..	..	..	..	..	..	..
Fracture	4	..	2	..	8	..	1	..	1	..
Wounds	35	..	6	..	22	..	4	..	..	..
Sprain	15	..	5	..	17	..	8	..	..	..
Dislocation	1	..	1	..	..	..	..	..	..	..
Blisters of the Feet	4	..	3	..	10	..	..	..	..	..
3. Homicidal:										
Gunshot	1	1	..	..	..	..	..	..	..	..
Cerebral Hæmorrhage from an injury in a fight	..	1	..	..	..	..	..	..	..	..
No appreciable disease	5	..	..	..	3	..	..	..	..	..
Total	1,463	14	278	6	1,611	19	358	6	53	25

NOTE.—Causes of deaths of Invalids, *see* end of Abstract No. 17.

APPENDIX No. XV—*continued.*

ABSTRACT No. 19, showing the admissions into Hospital and Deaths among Her Majesty's European Troops serving in Bengal, Madras, and Bombay, during the Year 1872, and the disabilities of the Invalids sent to England and discharged at Netley.

	Bengal.		Madras.		Bombay.		Invalids sent Home from			India.
Average Strength ..	36,839		11,511		10,898					59,248
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Bengal.	Madras.	Bombay.	Discharged at Netley.
I. *General Diseases.*										
1. Febrile :										
Small Pox	25	7	18	2	13	2	..	..	..	2
Cowpox	..	..	6	..	1	..	..	..	..	..
Chicken Pox ..	8	..	1	..	7	..	..	..	..	..
Measles	8	..	7	..	35	..	..	..	..	..
Scarlet Fever ..	2	1	3	..	1	..	..	..	..	..
Dengue „ ..	4,026	..	917	..	2,472	1	..	..	..	..
Cerebro-Spinal Fever	21	6	..	..	..	..	..	..	..	..
Enteric Fever ..	104	51	79	26	42	25	..	..	..	..
Simple Cont: Fever.	3,212	13	1,041	5	706	3	1	..	2	..
Febricula	1,370	..	458	..	416	..	..	..	..	..
Ague	11,568	3	1,323	..	5,264	1	90	3	14	6
Remittent Fever ..	1,990	45	79	3	142	3	9	1	2	..
Simple Cholera ..	4	2	2	2	1	1	..	..	..	..
Malignant Cholera..	588	387	..	..	42	33	..	..	..	..
Diphtheria	3	1	..	..	..	..	..	..	..	..
Mumps	8	..	5	..	..	..	..	..	..	..
Influenza	30	..	12	..	2	..	..	..	..	..
Phagedæna ..	1	..	..	..	7	..	..	..	..	..
Erysipelas	81	5	11	1	..	1	..	..	..	2
Pyæmia	..	..	2	1	8	..	..	..	..	..
2. Constitutional :										
Acute Rheumatism	534	..	110	..	124	..	5	..	2	..
Gonorrhœal Rheum:	17	..	1	..	7	..	..	..	..	..
Synovial „ ..	3	..	..	..	..	..	1	..	..	..
Muscular „ ..	535	..	108	..	177	..	2	1	..	1
Chronic „ ..	775	..	226	..	155	..	73	12	11	20
Acute Gout.. ..	6	..	..	..	1	..	..	..	..	..
Gouty Synovitis ..	..	..	..	..	..	..	1	..	..	..
Chr: Osteo-arthritis	..	..	1	..	..	..	3	..	..	1
Primary Syphilis ..	2,299	..	727	..	599	..	1	..	..	..
Secondary „ ..	840	1	330	3	160	2	88	36	18	20
Cancer	2	2	1	1	3	2	..	..	..	..
Colloid	2	..	..	..	..	..	1	..	..	..
Tumour	1	..	..	..	..	..	..	..	..	1
Lupus	3	..	3	..	1	..	3	..	..	2
Scrofula	25	..	10	..	5	..	9	..	3	4
Tuber: Meningitis..	1	..	..	1	..	..	..	..	..	..
Tabes Mesenterica..	1	1	..	..	..	..	..	..	..	..
Morbus Coxarius ..	..	..	..	..	2	..	..	..	..	2
Acute Miliary Tub:.	1	1	..	..	..	..	..	..	..	..
Phthisis Pulmonalis	345	39	134	17	98	18	104	40	19	100
Hæmoptysis (Tub:)	15	..	3	..	10	..	..	..	..	..
Diabetes	2	..	1	..	1	..	1	..	..	1
Purpura	2	..	..	..	2	1	..	..	..	..

Abstract No. 19—*continued.*

Diseases.	Bengal.		Madras.		Bombay.		Invalids sent Home from			India.
Average Strength ..	36,839		11,511		10,898					59,248
	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Bengal.	Madras.	Bombay.	Discharged at Netley.
Scurvy	15	1	7	..	2	..	..	..	..	..
Anæmia	199	2	24	..	28	1	51	7	14	7
General Dropsy ..	11	..	3	1	11	1	1	..	2	..
II. *Local Diseases:*										
1. Nervous System										
Encephalitis ..	9	1	1	1	2	1	..	..	..	..
Meningitis	20	8	4	1	1	..	4	1	1	..
Abscess of Brain ..	2	2	2	2	1	1	..	..	..	..
Apoplexy	26	18	4	10	12	11	2	..	..	..
Sunstroke	118	44	42	19	42	19	4	..	1	..
White Softening of Brain	4	2	..	..	..	..	1	..	1	..
Spinal Meningitis ..	6	1	..	..	..	..	..	..	..	..
Neuroma	1	..	..	..	..	..	..	..	..	..
Paralysis	50	2	18	1	13	..	16	2	3	14
Locomotor Ataxy ..	5	..	6	..	..	..	..	1	1	1
Tetanus	4	4	..	..	..	..	..	..	..	..
Hydrophobia ..	2	2	..	..	..	..	..	..	..	..
Epilepsy	94	4	26	..	18	1	18	8	2	9
Convulsions ..	2	..	..	..	1	..	..	..	..	..
Shaking Palsy ..	7	..	..	..	..	..	..	..	..	..
Chorea	1	..	..	..	1	..	..	..	..	..
Hysteria	1	..	..	..	1	..	..	..	..	..
Neuralgia	263	..	92	..	48	..	12	3	1	2
Sciatica	55	..	..	..	..	..	..	..	..	..
Hyperæsthesia ..	1	..	..	..	..	..	..	..	..	..
Hypochondriasis ..	6	..	4	..	..	..	1	..	..	..
Headache	..	..	..	..	..	..	..	..	..	1
Mania	29	1	6	..	4	..	19	6	2	..
Dementia	50	..	15	..	14	..	41	10	9	2
Paralysis of the insane	3	..	..	..	..	..	..	..	..	..
2. Diseases of the Eye:										
Conjunctivitis ..	733	..	175	..	143	..	1	..	1	..
Catarrhal Ophth: ..	6	..	4	..	1	..	1	1	..	..
Purulent „ ..	5	..	4	..	2	..	..	..	..	..
Gonorrhœal „ ..	3	..	1	..	..	..	1	..	..	..
Chronic „ ..	4	..	..	..	..	..	..	..	1	..
Pterygium	1	..	1	..	..	..	..	..	..	..
Keratitis	5	..	3	..	1	..	..	..	1	..
Ulcer of Cornea ..	5	..	5	..	3	..	1	..	..	..
Opacity „ ..	4	..	1	..	1	..	1	..	..	5
Sclerotitis	9	..	..	..	1	..	..	..	..	..
Iritis	33	..	4	..	8	..	..	..	..	..
Choroiditis	3	..	..	..	..	..	1	..	..	..
Retinitis	2	..	..	..	1	..	..	..	..	..
Amaurosis	6	..	2	..	1	..	2	1	1	1
Impaired Vision ..	9	..	5	..	6	..	7	..	2	15
Cataract	1	..	1	..	1	..	..	..	1	..
Glaucoma	..	..	..	..	..	..	..	..	..	1
Disorganization of eye from injury ..	..	..	..	..	..	..	..	..	..	1
Short Sight.. ..	3	..	..	..	..	..	1	..	..	1
Long „ ..	..	..	..	..	..	..	..	..	..	1

Abstract No. 19—*continued.*

Diseases.	Bengal.		Madras.		Bombay.		Invalids sent Home from			India.
Average Strength ..	36,839		11,511		10,898					59,248
	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Bengal.	Madras.	Bombay.	Discharged at Notley.
Hemeralopia ..	1	..	1	..	12	..	..	..	..	..
Nyctalopia	1	..	2	..	3	..	..	..	..	..
Astigmatism ..	..	..	..	..	1	..	..	..	..	..
Lachrymal Obstruct:	1	..	..	..	2	..	..	..	..	..
Inflam: of Eyelids..	1	..	..	..	..	..	1	..	..	..
Hordeolum	1	..	1	..	2	..	..	..	..	..
Tarsal Ophthalmia	67	..	22	..	31	..	1	..	1	3
Protrusion of Eyeball	..	..	..	..	..	..	1	..	..	..
3. Diseases of Ear:										
Infl: external Meatus	94	..	70	..	29	..	..	..	..	..
Abscess „ ..	15	..	12	..	4	..	..	..	..	..
Polypus	..	..	..	..	2	..	1	..	1	1
Infl: Membr: Tympani	82	..	28	..	14	..	1	..	..	..
Ulceration „ ..	2	..	..	..	..	..	..	..	..	1
Perforation „ ..	2	..	..	..	..	..	1	..	..	..
Obstruction of Eustachian tube ..	1	..	..	..	..	..	..	..	..	..
Inflam: Mastoid Cells	1	..	..	..	..	..	..	..	..	..
Organic disease of Internal Ear ..	1	..	..	..	..	..	..	..	..	1
Necrosis	..	..	..	..	1	..	..	..	..	..
Deafness	45	..	29	..	7	..	7	2	3	8
4. Diseases of Nose:										
Ozæna	1	..	7	..	2	..	..	..	..	1
Inflam. of Pituitary Membrane ..	2	..	..	..	..	..	..	..	..	..
Epistaxis	15	..	..	..	3	..	..	..	..	..
Polypus Nasi ..	..	..	1	..	..	..	..	..	..	..
Encysted Tumour ..	..	..	1	..	..	..	..	..	..	..
5. Circulatory Syst.										
Pericarditis.. ..	15	3	4	..	6	..	2	..	..	..
Valve Dis: of Heart.	131	12	48	8	16	4	70	12	14	81
Fibrinous concretions in cavity of Heart	2	1	..	..	..	..	..	..	..	..
Hypertrophy „	52	1	14	3	9	1	29	6	5	14
Atrophy „	2	..	..	..	..	..	..	..	..	..
Fatty Degeneration of Heart	2	3	3	2	..	..	..	..	..	..
Rupture of Heart ..	1	1	..	..	..	..	..	..	..	..
Angina Pectoris ..	3	..	2	..	..	..	..	..	..	..
Syncope	5	..	1	..	..	..	..	..	..	..
Palpitation	468	..	68	..	47	..	64	8	13	46
Atheroma	3	..	1	1	..	..	1	..	..	..
Occlusion (embolism)	..	1	..	..	1	1	..	..	..	..
Dilatation of Heart.	4	2	2	..	..	..	1	1	..	2
Aneurism of Aorta..	34	22	16	8	6	4	8	6	..	12
Aneurism	2	..	1	..	2	..	2	..	..	..
Rupture of Artery (Vertebral) ..	1	1	..	..	..	..	..	..	..	..
Rupture of Vena Cava	..	..	..	..	1	1	..	..	..	..
Phlebitis	1	..	..	..	1	..	..	..	..	..
Varicose Veins ..	21	..	8	..	4	..	8	5	3	7

Abstract No. 19—*continued.*

Diseases.	Bengal. Admitted.	Bengal. Died.	Madras. Admitted.	Madras. Died.	Bombay. Admitted.	Bombay. Died.	Invalids sent Home from Bengal.	Invalids sent Home from Madras.	Invalids sent Home from Bombay.	India. Discharged at Netley.
Average Strength ..	36,839		11,511		10,898					59,248
6. Absorbent Syst.										
Inflm: of Lymphatics	..	..	4	..	..	..	..	..	..	..
Inflam: of Glands ..	446	..	301	..	175	..	1	..	..	..
Suppuration „ ..	86	..	11	..	18	..	1	..	..	..
Hypertrophy „ ..	4	..	3	..	2	..	..	..	..	..
7. Diseases of Ductless Glands.										
Goitre	2	..	..	..	..	..	1	..	..	1
Addison's Disease ..	1	..	..	..	..	..	1	..	..	..
8. Respiratory Sys:										
Coryza	15	..	1	..	1	..	..	..	..	..
Laryngeal Catarrh..	23	..	..	..	..	..	..	..	..	..
Laryngitis	18	1	5	1	..	..	..	..	..	..
Necrosis of cartilage of Larynx ..	1	1	..	..	..	..	..	..	..	..
Aphonia	1	..	..	..	..	..	1	..	..	1
Bronchitis	1,660	6	444	1	299	1	30	4	22	12
Asthma	23	..	14	..	4	..	3	1	4	2
Pneumonia	221	34	14	..	37	4	4	1	2	..
Abscess of Lung ..	1	1	1	..	1	1	..	..	..	..
Gangrene of Lung ..	1	1	..	..	1	1	..	..	..	..
Congestion of Lungs	2	..	..	..	..	..	..	..	..	..
Pulmonary extrava:	2	2	..	..	..	..	..	..	..	..
Emphysema ..	2	..	2	..	..	..	3	..	..	1
Pleurisy	136	3	28	..	30	..	1	..	..	1
Empyema	..	..	..	..	..	..	..	..	..	1
9. Digestive Syst:										
Ulcer of Lips ..	1	..	..	..	..	..	..	..	..	..
Fissure „ ..	2	..	..	..	..	..	..	..	..	..
Stomatitis	8	..	5	..	4	..	..	..	..	..
Ulcerative Stomatitis	13	..	..	..	..	..	1	..	..	..
Inf: of Parotid Glands	2	..	..	..	..	..	..	..	..	..
Thrush	..	..	1	..	1	..	..	..	..	..
Abscess of Cheek ..	3	..	2	..	1	..	1	..	..	..
„ Antrum .	1	..	2	..	..	..	..	..	..	..
„ Upper Jaw	..	..	1	..	..	..	..	..	..	..
Osseous Tum: of Jaw	..	..	3	..	1	..	..	1	..	..
Caries of Dental Tis:	3	..	11	..	..	..	..	..	..	..
Necrosis	..	..	1	..	1	..	..	..	..	..
Inflam: Dental Pulp	1	..	..	..	..	..	..	..	..	..
Ulceration of Gums	10	..	4	..	2	..	..	..	1	..
Inflammation „	4	..	2	..	..	..	..	..	..	..
Gum Boil	55	..	39	..	16	..	..	..	..	..
Inflam: of Alveoli ..	3	..	..	..	..	..	..	..	..	..
Necrosis „ ..	1	..	..	..	..	..	..	..	..	..
Caries „ ..	1	..	1	..	..	..	..	..	..	..
Glossitis	1	..	..	..	..	..	..	..	..	..
Ulcer of Tongue ..	1	..	1	..	..	..	1	..	..	..
Sore Throat ..	27	..	9	..	..	..	..	..	..	..
Relaxed Throat ..	4	..	..	..	..	..	..	..	..	..
Ulcerated „ ..	18	..	7	..	2	..	..	..	..	..
Quinsy	..	..	1	..	..	..	..	..	..	..
Tonsillitis	521	..	190	..	121	..	..	..	..	..

Abstract No. 19—*continued.*

	Bengal.		Madras.		Bombay.		Invalids sent Home from			India.
Average Strength ..	36,839		11,511		10,898					59,248
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Bengal.	Madras.	Bombay.	Discharged at Netley.
Perforation of Palate	1	..	..	..	..	..	..	..	..	..
Pharyngitis.. ..	..	..	2	..	..	..	..	..	..	..
Ulcer of Pharynx ..	1	..	..	..	..	..	..	..	..	..
Abscess „ ..	6	..	..	..	..	..	..	..	..	..
Infl: of Saliv. Glands	9	..	4	..	3	..	..	..	..	..
Abscess „ ..	2	..	..	..	..	..	..	..	..	..
Gastritis	27	..	..	..	..	..	1	..	..	..
Ulcer of Stomach ..	..	..	3	1	..	..	2	..	..	..
Hæmatemesis ..	4	..	..	..	3	..	..	..	..	..
Dyspepsia	1,414	..	866	..	274	..	3	2	1	2
Gastrodynia ..	7	..	2	..	3	..	..	..	..	..
Enteritis	4	1	2	..	2	..	..	..	..	..
Typhlitis	4	..	5	..	3	..	1	..	..	..
Dysentery	1,262	51	969	28	366	11	45	45	4	29
Perfor : of Intestines	2	5	..	..	..	..	..	..	..	..
Fæcal Abscess ..	2	1	..	..	..	..	..	..	..	..
Hæmorrhage (Intes:)	2	..	..	..	2	..	..	..	..	..
Melæna	2	..	..	..	..	..	..	..	..	..
Dilatation of Ascending Colon ..	1	..	..	..	..	..	..	..	..	..
Intussusception ..	..	..	1	..	..	..	..	..	..	..
Hernia	32	..	17	..	8	..	10	5	10	15
Diarrhœa	2,841	12	901	2	670	3	9	5	2	1
Colic	253	..	64	..	51	..	..	..	..	..
Constipation ..	38	..	17	..	7	..	..	..	..	..
Ulceration of Rectum	..	..	4	..	1	..	..	..	..	..
Abscess „	1	..	..	..	..	..	..	..	..	..
„ Anus ..	4	..	6	..	2	..	..	..	..	1
Fistula in Ano ..	44	..	11	..	15	..	2	1	1	1
Hæmorrhoids ..	356	..	108	..	83	..	1	..	..	3
Fissure of Anus ..	4	..	3	..	..	..	..	..	..	..
Prolapsus of Anus ..	6	..	2	..	8	..	..	..	1	..
Prolapsus of Rectum	1	..	3	..	..	..	..	..	..	1
Stricture „	..	..	..	..	..	..	..	..	..	1
Condyloma of Anus	8	..	12	..	..	..	..	..	..	..
Tænia Solium ..	206	..	73	..	48	..	..	..	..	..
Ascaris Lumbricoides	5	..	2	..	1	..	..	..	..	..
Hepatitis	1,814	3	586	5	351	12	210	70	41	29
Abscess of Liver ..	89	55	43	35	12	8	9	3	3	1
Abscess of Liver, with Dysentery ..	45	43	..	..	..	..	..	..	..	..
Simple enlargement of Liver	90	..	44	..	6	..	1	..	..	5
Cirrhosis	14	10	4	1	8	3	..	..	2	1
Lardaceous Liver ..	1	1	..	..	..	..	..	..	..	..
Cyst of Liver ..	2	..	..	..	..	..	..	..	..	..
Hydatids of Liver ..	..	..	..	..	..	..	..	..	..	1
Jaundice	126	..	53	..	22	..	..	..	..	..
Obstruction of Biliary Ducts	1	..	..	..	..	..	1	..	..	..
Splenitis	227	1	18	..	27	..	6	..	2	1
Abscess of Spleen ..	1	..	..	..	..	..	..	..	..	..
Congestion „ ..	10	..	1	..	21	..	3	..	..	1
Hypertrophy „ ..	..	..	3	..	9	..	..	3	1	..

Abstract No. 19—*continued.*

	Bengal.		Madras.		Bombay.		Invalids sent Home from			India.
Average Strength ..	36,839		11,511		10,898					59,248
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Bengal.	Madras.	Bombay.	Discharged at Netley.
Leucocythæmia ..	..	..	..	..	..	..	1	..	..	..
Peritonitis	20	4	3	2	6	2	..	..	..	..
Ascites	6	..	..	..	2	..	1	..	..	..
10. Urinary Syst:										
Bright's Disease ..	38	3	7	3	6	2	6	2	1	8
Nephritis	19	..	..	..	5	..	1	..	..	..
Abscess of Kidney ..	1	1	..	..	..	..	..	..	..	..
Hæmaturia Renalis	3	..	..	..	..	..	..	..	..	..
Diuresis	..	..	..	..	2	..	..	..	..	..
Cystitis	33	..	2	..	1	..	2	1	1	..
Ulceration of Bladder	..	..	1	1	..	..	..	..	..	..
Calculus	1	1	..	..	1	..	1	..	1	..
Irritability of Bladder	3	..	..	..	..	..	..	..	..	..
Incontinence of Urine	13	..	2	..	6	..	..	1	..	..
Retention of „	1	..	..	..	1	..	..	..	..	..
Chronic enlargement of Prostate Glands	..	..	..	..	2	..	..	..	..	..
Abscess of Prostate Glands	2	1	..	..	2	..	..	..	..	..
Gonorrhœa	3,246	..	688	..	822	..	..	..	..	..
Phimosis, &c. ..	42	..	15	..	9	..	..	..	..	..
Bubo	29	..	11	..	10	..	..	..	..	..
Epididymitis (Gon:)	113	..	22	..	27	..	..	..	..	..
Warts on Penis ..	14	..	2	..	1	..	..	..	..	..
Stricture of Urethra	141	..	29	..	20	..	10	2	1	1
Ulcer of Urethra ..	2	..	..	..	..	..	..	..	..	..
Hæmorrhage from Urethra	1	..	..	..	..	..	..	..	..	..
Urinary Abscess ..	3	..	..	..	..	..	..	..	..	..
„ Fistula ..	8	..	..	..	..	..	2	..	..	..
Extravas: of Urine	1	..	1	..	..	..	..	..	..	..
11. Generative Sys:										
Inflam: of Penis ..	1	..	..	..	..	..	..	..	..	..
Abscess „ ..	3	..	..	..	..	..	..	..	..	..
Œdema of Scrotum	1	..	..	..	..	..	..	..	..	..
Varicocele	8	..	4	..	..	..	3	1	..	2
Inflam: of Tunica Vaginalis ..	1	..	..	..	..	..	..	..	..	..
Hydrocele	24	..	20	..	5	..	..	..	..	..
Hæmatocele ..	2	..	..	..	..	..	..	..	..	..
Orchitis	468	..	112	..	88	..	2	3	..	1
Abscess of Testicle..	3	..	..	..	..	..	..	..	..	..
Protrusion of Tubuli	4	..	..	..	1	..	2	..	..	1
Testicle retained in inguinal Canal ..	..	..	1	..	..	..	..	..	..	..
Spermatorrhœa ..	3	..	..	..	..	..	..	2	..	..
Neuralgia of Testicle	..	..	1	..	..	..	..	..	..	..
Inflam: of Mammilla	1	..	..	..	..	..	..	..	..	..
Hypertrophy „	1	..	..	..	..	..	..	..	..	..
Cyst „	..	..	..	..	1	..	..	..	..	..
Abscess „	1	..	..	..	..	..	..	..	..	..

Abstract No. 19—*continued.*

Diseases.	Bengal. Admitted.	Bengal. Died.	Madras. Admitted.	Madras. Died.	Bombay. Admitted.	Bombay. Died.	Invalids sent Home from Bengal.	Invalids sent Home from Madras.	Invalids sent Home from Bombay.	India. Discharged at Netley.
Average Strength ..	36,839		11,511		10,898					59,248
12. Organs of Loco:										
Ostitis	53	..	18	..	17	..	2	..	2	3
Caries	6	..	1	..	1	..	..	..	..	3
Necrosis	6	..	2	..	..	..	2	3	..	2
Hypertrophy of Bone	..	..	..	..	..	..	..	..	..	2
Osseous Tumour „	..	..	..	..	..	..	1	1	..	..
Cartilaginous Tum:	1	..	..	..	..	..	..	..	..	..
Contraction ..	8	..	6	..	1	..	6	..	1	11
Synovitis	73	..	19	..	21	..	6	..	2	1
Inflam: of Joints ..	1	..	..	..	..	..	..	..	..	..
Dropsy „ ..	1	..	2	..	..	..	..	..	..	..
Loose Cartilage ..	4	..	..	..	..	..	1	..	..	..
Relaxation of Ligam:	1	..	1	..	..	..	..	..	..	..
Displacement of Articular Cartilage..	..	..	3	..	..	..	..	..	..	..
Tumour of Hip ..	1	..	..	..	..	..	..	..	..	..
Psoas Abscess ..	4	3	..	..	..	..	..	..	..	..
Angular Deformity of Spine	..	..	..	..	..	..	..	1	..	1
Lateral curvature of Spine	1	..	..	..	..	..	..	..	..	..
Malformation of Spine	..	..	..	..	1	..	..	..	..	2
Inflam: of Muscle ..	1	..	..	..	..	..	..	..	..	..
Abscess „ ..	5	..	..	..	..	..	..	..	..	..
Atrophy „ ..	1	..	..	..	1	..	..	1	..	..
Glandular Tumour..	1	..	..	..	..	..	..	..	..	..
Simple Cyst ..	..	..	1	..	..	..	..	..	..	..
Club Foot	..	..	2	..	..	..	..	..	..	..
Talipes Equino Valgus	1	..	..	..	..	..	..	..	..	..
Enlarged Bursæ ..	13	..	1	..	1	..	..	..	..	..
Bursal Abscess ..	1	..	..	..	1	..	..	..	..	..
Bunion	..	..	1	..	2	..	..	..	..	..
Ganglion	1	..	..	..	1	..	..	..	..	..
13. Diseases of Cellular Tissue.										
Inflam: of Cell: Tissue	90	..	120	1	23	..	1			
Abscess „ „	396	..	117	..	166	..	2	..	..	..
Obesity	..	..	..	..	..	..	1	..	..	2
Tumour	..	..	1	..	..	..	..	..	..	..
Encysted Tum: Groin	..	..	1	..	..	..	..	..	..	..
Fibro Cystic Tumour of Neck	2	..	..	..	..	..	..	..	..	..
Non-malignant Tum: Fibrous of Neck ..	..	..	1	..	..	..	..	..	..	..
Guinea Worm ..	1	..	6	..	27	..	..	..	..	..
14. CutaneousSyst:										
Erythema	16	..	4	..	4	..	..	..	..	..
Intertrigo	5	..	..	..	..	..	..	..	..	..
Roseola	3	..	1	..	..	..	..	..	..	..

Abstract No. 19—*continued.*

Diseases.	Bengal.		Madras.		Bombay.		Invalids sent Home from			India.
Average Strength ..	36,839		11,511		10,898					59,248
	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Bengal.	Madras.	Bombay.	Discharged at Netley.
Urticaria	19	..	8	..	9	..	..	..	..	..
Prurigo	3	..	..	..	..	..	..	..	..	..
Lichen	20	..	10	..	4	..	..	..	..	..
Psoriasis	50	..	9	..	10	..	1	..	..	1
Herpes	85	..	17	..	24	..	..	..	..	..
Pemphigus	6	..	2	..	1	..	..	..	..	..
Eczema	178	..	44	..	64	..	2	..	..	1
Impetigo	11	..	8	..	..	..	..	..	..	..
Rupia	6	..	..	..	..	..	..	..	..	..
Ecthyma	3	..	..	..	1	..	..	..	..	..
Acne	8	..	4	..	..	..	..	..	..	..
Sycosis	..	..	1	..	..	..	..	..	..	..
Ichthyosis	1	..	..	..	..	..	..	..	..	..
Melasma	1	..	..	..	..	..	..	..	..	..
Chilblain	1	..	..	..	..	..	..	..	..	..
Ulcer	880	..	431	..	291	..	6	1	3	13
Boil	580	..	273	..	204	..	..	..	..	..
Carbuncle	9	1	10	..	4	..	..	..	..	..
Whitlow	89	..	37	..	51	..	..	1	..	..
Thecal Abscess ..	..	..	2	..	..	..	..	..	..	..
Hypertrophy of Skin	..	..	..	..	..	..	1	..	..	..
Corn	5	..	..	..	1	..	..	..	..	..
Fibro-cellular Tumour	6	..	4	..	9	..	1	..	..	..
Fatty Tumour ..	5	..	1	..	..	..	..	..	..	..
Sebaceous Tumour	1	..	..	..	..	..	..	..	..	..
Warts	90	..	22	..	11	..	..	..	..	..
Delhi Boil	34	..	..	..	..	..	1	..	..	3
Ingrown Nail ..	79	..	17	..	17	..	1	..	..	..
Pruritus	..	..	1	..	..	..	..	..	..	..
Tinea	54	..	41	..	9	..	1	..	..	..
Itch	56	..	30	..	7	..	..	..	..	..
Phthiriasis	3	..	..	..	1	..	..	..	..	..
Irritation by Stinging Insects ..	11	..	7	..	..	..	..	..	..	..
Mosquito Bite ..	..	..	..	..	1	..	..	..	..	..
Scorpion Sting ..	..	..	..	..	2	..	..	..	..	..
Miliaria	2	..	..	..	..	..	..	..	..	..
III. *Conditions, &c.*										
General Debility ..	799	1	451	..	230	1	258	95	36	51
IV. *Poisons.*										
Lead Palsy	1	..	..	..	..	..	..	..	..	..
Copper Poisoning ..	1	..	..	..	..	..	..	..	..	..
Vegetable (not specified)	1	..	..	..	..	..	..	..	..	..
Indian Hemp ..	..	..	..	..	1	..	..	..	..	..
Alcohol	8	5	..	..	9	..	..	..	..	..
Delirium Tremens ..	148	5	51	4	45	..	..	..	..	..
Poisoning by Jatropha Curcas	..	..	1	..	..	..	..	..	..	..

Abstract No. 19—*continued.*

	Bengal.		Madras.		Bombay.		Invalids sent Home from			India.
Average Strength ..	36,839		11,511		10,898					59,248
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Bengal.	Madras.	Bombay.	Discharged at Netley.
V. *Injuries.*										
2. Accidental:										
Burns and Scalds ..	42	..	18	..	7	..	..	..	..	..
Lightning Stroke ..	1	..	..	..	..	..	..	..	..	..
Multiple Injury ..	1	1	..	..	..	1	..	..	..	..
Asphx: by Drowning	1	15	..	8	..	6	..	..	..	..
Contusion	1,404	..	552	..	380	..	2	..	..	2
Rupture of Urethra .	..	..	1	..	..	..	..	..	..	..
Injury of Spinal Cord	1	..	..	..	..	..	..	..	1	..
Hæmorrhage from Brain from a Blow	..	1	..	..	..	..	..	..	..	..
Concuss: of the Brain	3	1	2	1	4	2	..	1	1	..
Fracture	144	5	57	1	31	..	13	4	..	12
Wounds	407	1	241	..	167	..	1	..	4	1
„ from Gunshot	12	1	2	..	4	1	2	2	..	4
Sprain	863	..	246	..	245	..	3	..	3	1
Dislocation	36	..	12	..	8	..	2	..	1	3
Blisters of the Feet	101	..	23	..	24	..	..	..	..	..
Foreign Body in Cornea	..	..	2	..	..	..	..	..	..	..
Foreign Bodies of Œsophagus ..	..	..	..	..	1	..	..	..	..	..
Foreign Body embedded	1	..	..	..	..	..	..	..	..	..
Asphyxia by plugging of Air Passages ..	..	2	..	..	..	..	..	..	..	..
Rupture of Muscle ..	4	..	..	..	1	..	..	..	..	2
3. Homicidal:										
Contusion	..	..	1	..	..	..	..	..	..	..
Scalp Wound ..	..	..	1	..	..	..	..	..	..	..
Gun Shot Wound ..	4	3	1	1	..	..	..	..	..	..
4. Self-inflicted:										
Asphyx: by Drowning	..	2	..	1	..	..	..	..	..	..
Asphyx: by Hanging	..	1	..	..	1	1	..	..	..	..
Cut Throat	4	1	..	..	2	2	..	..	..	..
Gun Shot Wound ..	2	19	1	1	..	4	1	..	..	..
Wounds	1	..	..	..	..	..	..	..	..	..
Poisoning by Corrosive Sublimate .	..	1	..	..	..	..	..	..	..	..
Multiple Injury ..	..	1	..	..	..	..	..	..	..	..
5. Judicial:										
Punishm: not defined	4	..	..	..	..	..	..	..	..	..
Hanging	..	..	..	1	..	..	..	..	..	..
VI. *Surgical Operations.*										
Dilatation of stricture of Urethra by Hill's dilator ..	1	..	..	..	..	..	..	..	..	..
Perineal Section ..	1	..	..	..	..	..	..	..	..	..

Abstract No. 19—*continued.*

Diseases.	Bengal. Admitted.	Bengal. Died.	Madras. Admitted.	Madras. Died.	Bombay. Admitted.	Bombay. Died.	Invalids sent Home from Bengal.	Invalids sent Home from Madras.	Invalids sent Home from Bombay.	India. Discharged at Netley.
Average Strength ..	36,839		11,511		10,898					59,248
Amputn: of Finger	..	..	2	..	1	..	..	..	1	1
„ of Hand ..	..	..	..	..	..	..	..	..	..	1
„ of Thigh..	..	..	..	..	..	..	..	..	..	3
„ of Leg ..	..	..	..	..	..	..	..	..	1	1
„ of Arm ..	..	..	..	..	..	..	..	..	..	1
Removal by knife, Sebac: Tum: Skin	..	..	1	..	..	..	..	..	..	..
Removal by knife of a Simple Cystic Tumour Cell: Tis:	..	..	2	..	..	..	..	..	..	..
Operation on Cicatrices of Neck ..	..	..	1	..	..	..	..	..	..	..
Amputations (part not stated) ..	12	..	..	..	..	..	3	..	..	..
Excisions	2	..	..	..	..	..	..	..	..	..
Trephining (left parietal bone) ..	1	..	..	..	..	..	..	..	..	..
Incisions (cicatrix of burn in Axilla) ..	1	..	..	..	..	..	..	..	..	..
Removal of Neuroma	1	..	..	..	..	..	..	..	..	..
Operation not defined	1	..	..	..	..	..	..	..	..	..
No apprble. Disease	33	..	14	..	5	..	..	..	..	..
Total	54,946	1016	15,240	218	16,973	205	1,481	436	312	653

CAUSES of the Deaths of the Invalids from India.

	Bengal.	Madras.	Bombay.
Small-pox	1	..	..
Syphilis	1	..	..
Phthisis	9	4	4
Atheroma	1	..	..
Valve disease of Heart	6	1	..
Aneurism of Aorta	1	1	1
Pneumonia..	4	..	..
Bronchitis	..	2	1
Dysentery	2	2	..
Diarrhœa	1	..	..
Hepatitis	3	..	1
Cirrhosis of Liver	..	..	2
Abscess „	4	..	..
Bright's Disease	..	1	1
Pyelitis	1	..	..
Psoas Abscess	1	..	..
General Debility	3	..	..
Carbuncle	1	..	..
Total	39	11	10

APPENDIX No. XV—*continued.*

ABSTRACT No. 20, showing the Ages of the Troops serving in the Bengal Command, and the Deaths at each Age, during the Year 1872.

Corps.	Under 20.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.		Total.	
	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.
4th Hussars	10	..	103	3	114	6	133	9	64	7	9	2	433	27
5th Lancers..	10	..	37	..	82	2	227	7	69	5	18	..	443	14
11th Hussars	51	..	140	1	111	..	92	3	21	2	12	..	427	6
21st „	9	..	138	1	92	1	144	4	35	3	7	..	425	9
A Brigade, R.H.A...	8	..	256	10	227	10	122	4	107	2	6	..	726	26
F „ „	8	..	188	10	206	5	204	10	90	4	11	2	707	31
8th „ R.A.	7	..	208	5	275	10	224	11	168	5	29	4	911	35
13th „ „	12	..	325	12	175	10	67	1	40	3	13	1	632	27
16th „ „	17	1	207	3	264	10	213	6	118	3	12	1	831	24
19th „ „	43	..	206	4	284	3	238	7	87	8	18	..	876	22
1st Foot, 2nd Battalion	130	2	266	6	220	9	200	6	62	4	13	2	891	29
3rd „ 1st „	51	..	260	1	234	1	223	1	85	6	25	3	878	12
5th „ 1st „	49	..	419	1	314	8	130	3	59	2	5	1	976	15
6th „ 1st „	8	..	287	15	291	16	167	10	82	2	13	1	848	44
11th „ 1st „	226	..	261	4	207	4	86	3	44	2	13	3	837	16
12th „ 2nd „	46	..	175	2	269	1	251	3	70	1	13	1	824	8
14th „ 1st „	54	2	321	2	165	..	142	3	130	6	17	..	829	13
17th „ 1st „	68	1	396	9	254	7	133	1	61	4	12	1	924	23
19th „ 2nd „	26	..	158	7	286	9	256	18	80	5	25	4	831	43
25th „ 2nd „	52	..	232	..	372	4	198	4	56	1	8	..	918	9

Abstract No. 20—*continued.*

Corps.	Under 20.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.		Total.	
	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.
26th Foot	32	..	266	6	269	12	207	8	55	5	21	1	850	
36th „	25	..	172	6	257	5	227	5	126	2	11	..	818	
37th „	50	1	190	22	200	15	260	35	132	12	10	2	842	
39th „	40	..	363	1	201	2	186	3	115	1	22	..	927	
41st „	36	..	269	4	274	5	226	5	66	8	9	..	880	
54th „	63	2	354	13	188	11	207	7	100	4	11	..	923	37
55th „	13	..	125	4	221	3	336	13	155	14	16	2	866	36
58th „	81	..	234	6	335	2	98	3	34	3	2	..	784	14
60th „ 2nd Battalion	71	..	423	3	283	8	234	4	80	1	19	..	1,110	16
62nd „	37	1	122	4	295	4	262	3	107	..	10	1	833	13
63rd „	76	..	354	3	213	3	205	..	65	..	10	..	923	6
65th „	20	3	374	9	267	5	179	4	121	8	..	..	961	29
70th „	125	1	386	13	146	2	178	4	48	5	11	1	894	26
72nd „	107	..	401	10	183	8	157	5	55	1	3	1	906	25
85th „	58	2	446	9	210	4	172	4	64	8	9	1	959	28
92nd „	53	..	306	5	287	4	170	..	38	1	13	..	867	10
96th „	38	..	255	5	249	6	219	6	69	3	7	4	837	24
106th „	34	..	276	2	252	4	172	3	95	4	44	..	873	13
109th „	109	..	142	9	191	2	164	4	270	1	26	7	902	23
	1,953	16	10,041	230	8,963	221	7,309	230	3,323	156	533	46	32,122	899

Abstract No. 20—*continued.*

ABSTRACT showing the Ages of the Troops serving in the Madras Command, and the Deaths at each Age, during the Year 1872.

Corps.	Under 20 Years.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.		Total.	
	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.
16th Lancers	22	..	97	2	131	4	157	5	63	4	11	3	481	18
18th Hussars	30	1	42	2	81	..	159	5	45	2	9	1	366	11
5th Brigade, Royal Artillery ..	32	..	111	6	145	3	66	..	54	1	23	1	431	11
6th „ „	1	..	30	..	10	1	37	1	5	..	6	..	89	2
9th „ „	8	..	131	3	85	1	97	1	12	1	2	..	335	6
18th „ „	1	..	16	..	52	..	40	..	24	1	..	..	133	1
20th „ „	17	1	241	7	237	2	216	9	145	6	61	2	917	27
2nd Battalion, 10th Foot	93	1	215	1	304	3	183	3	18	2	3	2	816	12
1st „ 21st „	190	1	290	5	142	1	179	6	49	2	33	..	883	15
2nd „ 24th „	122	2	330	6	205	3	144	7	61	2	7	1	869	21
44th Foot	39	..	480	6	149	4	157	1	61	4	18	2	904	17
45th „	10	..	214	1	290	3	329	10	124	3	10	..	977	17
76th „	108	..	169	4	234	8	299	8	118	2	9	2	937	24
89th „	81	..	424	2	138	2	168	1	90	3	16	2	917	10
Total ..	754	6	2,790	45	2,203	35	2,231	57	869	33	208	16	9,055	192

Abstract No. 20—*continued.*

ABSTRACT showing the Ages of the Troops serving in the Bombay Command, and the Deaths at each Age, during the Year 1872.

Corps.	Under 20 Years.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.		Total.	
	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.
3rd Hussars..	25	..	173	1	114	4	137	4	25	1	8	..	482	10
6th Brigade, Royal Artillery ..	5	..	148	4	110	3	50	..	113	6	31	..	457	13
9th „ „	21	..	145	4	176	2	127	4	73	3	8	..	550	13
18th „ „	17	..	187	1	310	3	213	4	103	3	32	..	862	11
1st Battalion, 2nd Foot	21	..	385	1	282	2	138	2	110	1	15	..	951	6
49th Foot	81	..	390	5	261	3	121	6	38	1	..	..	891	15
56th „	214	2	448	5	111	1	78	2	49	1	2	1	902	12
59th „	47	3	493	18	197	9	107	6	52	1	16	..	912	37
66th „	161	..	450	10	105	3	119	3	72	4	4	1	911	21
83rd „	87	..	399	5	271	4	111	2	31	1	12	..	911	12
108th „	81	..	256	2	292	8	176	7	67	5	6	2	878	24
Total	760	5	3,474	56	2,229	42	1,377	40	733	27	134	4	8,707	174

APPENDIX No. XV—*continued.*

ABSTRACT No. 21, showing the Cases of Sickness and Deaths among Troops on board Ship, proceeding on and returning from Foreign Service, and proceeding from one Colony or Station to another.

	Passage Out.						Passage Home.				Inter-colonial.	
	To Mediterranean.		To other Stations except India.		To India.		From all Stations except India.		From India.			
Embarked	2,005		1,947		8,531		1,786		2,722		6,885	
Average Annual Strength ..	78		228		871		129		253		195	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
I. *General Diseases.*												
1. Febrile:												
Chicken Pox ..	..	..	1	..	..	..	..	..	..	..	..	..
Measles	4	..	2	..	5	..	..	..	1	..	5	..
Scarlet Fever ..	..	..	2	..	..	..	..	..	..	..	..	..
Enteric Fever ..	..	..	..	..	2	..	..	..	1	..	..	..
Simple Cont: Fever	2	..	5	..	7	1	1	..	1	..	9	1
Febricula	..	..	1	..	20	..	..	..	1	..	5	..
Ague	..	..	1	..	1	..	7	..	75	..	38	..
Mumps	..	..	..	..	..	..	..	..	..	..	3	..
Erysipelas	..	..	..	..	1	..	..	..	..	..	..	..
2. Constitutional:												
Gonorrhœal Rheum:	..	..	..	..	1	..	..	..	..	..	..	..
Muscular „ ..	..	..	2	..	1	..	..	..	..	..	..	..
Chronic „ ..	..	..	..	..	5	..	1	..	5	..	1	..
Primary Syphilis ..	3	..	13	..	58	..	..	..	5	..	18	..
Secondary „	..	..	2	..	6	..	..	..	..	..	6	..
Acute Rheumatism	2	..	4	..	10	..	3	..	2	..	..	..
Scrofula	..	..	..	..	1	..	..	..	..	..	..	..
Phthisis Pulmonalis	..	..	..	..	..	..	..	..	4	1	..	..
Purpura	..	..	..	..	1	..	..	..	..	..	..	..
Anæmia	..	..	..	..	..	..	1	..	..	..	..	..
Beri-Beri	..	..	..	..	..	..	..	..	..	..	1	..
II. *Local Diseases.*												
1. Diseases of the Nervous System:												
Sunstroke	..	..	..	..	1	..	..	..	1	..	..	..
Paralysis	..	..	..	..	1	..	..	..	..	..	..	..
Epilepsy	1	..	..	..	..	..	..	..	..	..	2	..
Neuralgia	..	..	1	..	..	..	..	..	..	..	..	..
Brow Ague	..	..	..	..	1	..	..	..	..	..	..	..

Abstract No. 21—*continued.*

	Passage Out.						Passage Home.				Inter-colonial.	
	To Mediterranean.		To other Stations except India.		To India.		From all Stations except India.		From India.			
Embarked	2,005		1,947		8,531		1,786		2,722		6,885	
Average Annual Strength ..	78		228		871		129		253		195	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
2. Diseases of the Eye:												
Conjunctivitis ..	..	..	..	..	3	..	..	..	3	..	3	..
Keratitis	..	..	..	..	..	..	..	..	..	..	1	..
3. Diseases of the Ear:												
Deafness	..	..	1	..	..	..	..	..	..	..	..	..
Inflam: Ext: Meatus	..	..	..	..	..	..	1	..	..	..	..	..
4. Diseases of the Nose:												
Epistaxis	..	..	1	..	..	..	..	..	..	..	..	..
5. Circulatory System:												
Valve Dis: of Heart	..	..	..	..	..	1	..	..	1	..	..	..
Hypertrophy „	..	..	..	..	..	1	..	..	..	..	..	..
Aneurism of Aorta	..	..	..	..	..	..	..	..	..	..	1	..
6. Absorbent System:												
Inflam: of Glands ..	..	..	..	..	6	..	..	..	1	..	2	..
Suppuration „	..	..	..	..	..	..	..	..	1	..	..	..
8. Respiratory System:												
Laryngitis	..	..	..	..	1	..	..	..	..	..	..	..
Bronchitis	..	..	10	..	16	..	1	..	8	..	3	..
Pneumonia.. ..	3	..	3	..	7	1	1	..	..	..	2	..
Pleurisy	..	..	1	..	2	1	..	..	..	..	..	..
9. Digestive System:												
Tonsillitis	2	..	6	..	21	..	..	..	4	..	4	..
Dyspepsia	1	..	2	..	1	..	1	..	..	..	1	..
Dysentery	..	..	..	..	..	..	..	..	11	..	1	..
Diarrhœa	..	..	2	..	5	..	6	..	5	..	4	..
Colic	..	..	..	..	2	..	..	..	..	..	..	..
Constipation ..	..	..	..	..	..	..	..	..	1	..	..	..
Hæmorrhoids ..	..	..	..	..	1	..	..	..	..	..	..	..
Hepatitis	..	..	..	..	1	..	1	..	7	1	1	..
Jaundice	1	..	1	..	5	1	..	..	1	..	..	..
Sea Sickness ..	..	..	11	..	..	..	..	..	..	..	..	..

Abstract No. 21—*continued.*

	Passage Out.						Passage Home.				Inter-colonial.	
	To Mediterranean.		To other Stations except India.		To India.		From all Stations except India.		From India.			
Embarked	2,005		1,947		8,531		1,786		2,722		6,885	
Average Annual Strength ..	78		228		871		129		253		195	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
10. Urinary System :												
Bright's Disease ..	..	..	1	..	..	..	..	..	..	..	..	..
Gonorrhœa	8	..	5	..	53	..	2	..	4	..	6	..
Phimosis, &c. ..	1	..	1	..	3	..	..	..	..	..	..	..
Bubo	..	..	5	..	7	..	..	..	1	..	2	..
Epididymitis (Gon:)	..	..	2	..	1	..	..	..	..	..	1	..
11. Generative Syst.:												
Hydrocele	..	..	..	..	..	..	..	..	..	..	1	..
Orchitis	..	..	2	..	3	..	..	..	3	..	3	..
12. Organs of Locomotion.												
Acute Synovitis ..	1	..	..	..	..	..	..	..	..	..	..	..
Dropsy of Joint ..	..	..	..	..	..	..	..	..	..	..	1	..
Psoas Abscess ..	..	..	1	..	..	..	..	..	..	..	..	..
Contraction.. ..	..	..	..	..	..	..	1	..	..	..	..	..
13. Diseases of Cellular Tissue.												
Inflam: of Cell: Tis:	1	..	1	..	2	..	..	..	..	..	1	..
Abscess „ „	2	..	4	..	5	..	1	..	1	..	3	..
14. Cutaneous Syst.:												
Erythema	..	..	1	..	..	..	..	..	..	..	..	..
Lichen	..	..	..	..	2	..	..	..	..	..	..	..
Herpes	..	..	..	..	2	..	..	..	..	..	..	..
Eczema	..	..	..	..	6	..	1	..	..	..	1	..
Impetigo	..	..	..	..	1	..	..	..	..	..	..	..
Ulcer	..	..	9	..	17	..	3	..	7	..	10	..
Boil	..	..	1	..	8	..	..	..	1	..	2	..
Whitlow	1	..	..	..	2	..	..	..	..	..	1	..
Warts	..	..	1	..	4	..	..	..	..	..	1	..
Tinea	..	..	..	..	2	..	..	..	..	..	..	..
Itch	..	..	2	..	12	..	..	..	..	..	..	..
III. *Conditions, &c.*												
General Debility ..	1	..	2	..	7	..	..	..	1	..	3	..

Abstract No. 21—*continued.*

	Passage Out.						Passage Home.				Inter-colonial.	
	To Mediterranean.		To other Stations except India.		To India.		From all Stations except India.		From India.			
Embarked	2,005		1,947		8,531		1,786		2,722		6,885	
Average Annual Strength ..	78		228		871		129		253		195	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
IV. *Poisons.*												
Delirium Tremens..	..	..	..	..	..	..	1	..	..	..	3	1
V. *Injuries.*												
2. Accidental:												
Burns and Scalds ..	..	..	2	..	2	..	..	..	3	..	..	..
Contusion	4	..	1	..	8	..	..	..	2	..	4	..
Concussion of Brain	..	..	1	..	1	..	..	..	..	..	..	..
Fracture	..	..	1	..	..	..	..	..	..	..	..	..
Wounds	..	..	3	..	8	..	..	..	1	..	1	..
Sprain	..	..	2	..	4	..	..	..	..	..	1	..
Dislocation	1	..	..	..	..	..	..	..	..	..	1	..
4. Self-inflicted:												
Drowned	..	..	..	..	..	..	..	..	..	..	..	1
No appreciable disease	..	..	..	..	1	..	..	..	..	..	..	..
Total	39	..	120	..	354	6	33	..	163	2	157	3

APPENDIX

ABSTRACT of Results of Meteorological Observations taken

ALDERSHOT CAMP. Lat. 51° 15′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Mean of all the highest.	Mean of all the lowest.	Mean Daily Range.	Mean Approximate Temperature.	Maximum in Sun's rays.	Minimum on Grass.	Hygrometer. Dry Bulb.	Hygrometer. Wet Bulb.
January	29·253	29·780	28·230	54·1	28·8	25·3	46·1	34·8	11·3	40·4	61·4	31·3	41·3	39·7
February	29·445	29·799	29·145	55·0	33·8	21·2	51·2	39·1	12·1	45·1	76·2	35·6	45·6	43·6
March	29·445	29·955	28·947	60·6	24·8	35·8	53·2	37·7	15·5	45·4	85·6	34·3	47·2	44·0
April	29·542	30·081	28·771	69·8	31·4	38·4	58·7	39·3	19·4	49·0	105·7	36·7	52·2	47·0
May	29·553	30·043	29·069	73·2	32·0	41·2	61·5	43·4	18·1	52·4	113·9	40·7	54·9	49·3
June	29·551	29·920	29·071	85·4	40·8	44·6	70·8	50·3	20·5	60·5	117·7	47·7	64·2	58·1
July	29·575	29·869	29·319	88·4	48·0	40·4	79·0	55·8	23·2	67·4	127·1	53·3	70·2	64·3
August	29·624	29·968	29·112	81·4	46·4	35·0	73·4	52·5	20·9	62·9	119·8	50·5	65·5	61·6
September	29·507	29·952	29·085	81·0	35·4	45·6	68·3	49·7	18·6	59·0	108·2	47·6	61·0	55·9
October... ...	29·343	29·965	28·900	65·2	28·6	36·6	56·6	41·0	15·6	48·8	81·2	38·3	50·0	47·8
November	29·303	29·969	28·553	60·2	31·6	28·6	50·4	39·4	11·0	44·9	67·7	36·6	45·4	43·5
December	29·215	29·645	28·484	54·2	26·4	27·8	46·7	37·2	9·5	41·9	58·7	32·4	42·7	41·3
Yearly Sums, Means, and Totals ...	29·446	29·912	28·907	69·0	34·0	35·0	59·6	43·3	16·3	51·5	93·6	40·4	53·3	49·7

CANTERBURY. Lat. 51° 17′ N.

January	...	...	...	52·0	9·0	43·0	46·8	29·1	17·7	37·9	...	...	42·9	41·6
February	...	...	...	58·5	27·5	31·0	52·5	34·5	18·0	43·5	...	...	46·7	44·9
March	...	...	...	61·0	21·0	40·0	55·0	31·6	23·4	43·3	...	...	48·3	45·5
April	...	...	...	72·3	25·0	47·3	60·0	35·5	24·5	47·7	...	...	54·1	49·4
May	...	...	...	74·6	25·1	49·5	63·5	38·0	25·5	50·7	...	...	57·0	52·6
June	...	...	...	88·0	36·2	51·8	72·9	45·7	27·2	59·3	...	...	65·7	59·7
July	...	...	...	94·2	36·8	57·4	79·7	50·7	29·0	65·2	...	...	72·7	65·4
August	...	...	...	81·0	40·0	41·0	72·7	47·9	24·8	60·3	...	...	66·2	60·6
September	...	...	...	84·8	27·2	57·6	69·9	45·1	24·8	57·5	...	...	63·3	58·0
October	...	...	...	66·4	26·0	40·4	58·8	36·6	22·2	47·7	...	...	53·3	51·4
November	...	...	...	62·7	27·2	35·5	51·8	37·4	14·4	44·6	...	...	46·9	44·9
December	...	...	...	55·6	25·5	30·1	48·8	34·6	14·2	41·7	...	...	44·0	42·5
Yearly Sums, Means, and Totals ...	...	...	...	71·0	27·2	43·8	61·0	38·9	22·1	49·9	...	...	55·5	51·3

CHATHAM. Lat. 51° 23′ N.

January	29·515	30·044	28·557	54·2	24·3	29·9	48·0	32·8	15·2	40·4	66·9	31·7	42·1	41·2
February	29·575	30·026	29·358	59·2	28·8	30·4	53·1	35·7	17·4	44·4	77·7	34·2	46·4	45·5
March	29·651	30·156	29·070	63·1	22·3	40·8	55·4	34·8	20·6	45·1	86·6	33·0	47·8	46·5
April	29·743	30·319	28·987	70·7	25·8	44·9	60·6	36·8	23·8	48·7	97·0	35·1	52·7	50·7
May	29·745	30·224	29·232	74·3	27·4	46·9	63·6	39·0	24·6	51·3	110·7	37·3	55·5	52·8
June	29·761	30·137	29·291	87·4	37·6	49·8	72·8	47·2	25·6	60·0	124·1	45·4	64·8	62·3
July	29·769	30·075	29·519	93·4	42·1	51·3	78·9	52·1	26·8	65·5	128·9	50·3	70·6	67·9
August	29·820	30·166	29·374	79·2	42·5	36·7	72·8	50·2	22·6	61·5	119·9	48·9	64·7	62·6
September	29·698	30·162	29·210	82·0	34·2	47·8	69·6	47·4	22·2	58·5	109·1	46·4	62·3	60·2
October... ...	29·540	30·185	29·128	68·2	28·8	39·4	58·5	38·2	20·3	48·3	96·8	36·6	51·8	50·5
November	29·532	30·147	28·790	63·7	25·5	38·2	53·2	36·1	17·1	44·6	86·1	35·3	46·1	44·7
December	29·420	29·828	28·700	57·8	24·7	33·1	49·8	34·9	14·9	42·3	81·5	33·9	43·9	42·4
Yearly Sums, Means, and Totals ...	29·647	30·122	29·101	71·1	30·3	40·8	61·3	40·4	20·9	50·8	98·7	39·0	54·1	52·3

No. XVI.

at Stations in England and Scotland in the Year 1872.

Long. 0° 45′ W. Height above Sea 325 feet.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.											
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.					Amount of Rain fall.	
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, Days.	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	On the Ground.	25 Feet above the Ground.
											lbs. per sq. foot	Miles				Inches	Inches
37·7	·227	2·6	0·4	87·8	540·9	2·50	4·50	15·50	8·50	0·00	...	270·2	8·0	2. 8	27	5·95	4·26
41·3	·261	3·0	0·6	85·6	539·6	2·50	6·00	13·50	7·00	0·00	...	253·3	8·2	2·4	20	2·25	1·72
40·4	·251	2·9	0·8	77·8	537·9	4·50	5·00	10·00	11·50	0·00	...	243·6	7·2	2·1	14	2·35	1·59
41·7	·265	3·0	1·3	68·0	534·6	9·00	4·50	6·50	10·00	0·00	...	239·5	7·0	2·6	15	1·16	1·53
43·9	·287	3·3	1·6	66·0	531·6	7·50	4·50	6·50	12·50	0·00	...	233·8	7·5	2·5	16	2·68	1·98
53·0	·403	4·5	2·1	66·7	521·4	3·50	2·50	12·00	12·00	0·00	...	224·3	7·1	2·4	18	2·80	2·04
59·8	·515	5·6	2·5	69·4	515·2	5·00	5·50	9·00	11·50	0·00	...	135·8	6·8	2·0	13	2·69	2·38
58·4	·491	5·4	1·5	78·5	520·9	7·00	6·50	8·50	9·00	0·00	...	199·9	6·7	1·5	12	2·24	1·93
51·5	·380	4·3	1·7	71·5	524·0	2·00	1·00	8·50	18·50	0·00	...	271·0	7·1	1·6	12	1·60	1·27
45·5	·304	3·5	0·6	84·8	532·8	4·50	4·00	10·50	12·00	0·00	...	187·2	8·0	1·7	19	5·51	3·95
41·4	·260	3·0	0·5	86·1	537·3	4·50	2·00	12·00	11·50	0·00	...	353·3	7·9	2·7	22	3·56	2·54
39·6	·244	2·8	0·3	88·0	538·2	4·00	5·00	13·50	8·50	0·00	...	279·8	8·5	2·0	24	5·02	3·73
46·2	·324	3·7	1·2	77·5	531·2	56·50	51·00	126·00	132·50	00·0	...	236·0	7·5	2·2	212	37·81	28·92

Long. 1° 5′ E. Height above Sea 80 feet.

40·0	·248	2·9	0·3	89·6	...	4·00	0·75	12·50	13 25	0·50	...	...	6·1	4·7	23	3·28	...
42·9	·276	3·1	0·5	88·0	...	1·75	0·75	16·50	9·50	0·50	...	...	4·4	5·4	19	0·76	...
42·4	·272	3·1	0·7	80·7	...	7·25	2·50	12·25	8·50	0·50	...	...	5·1	4·5	16	1·86	...
44·8	·296	3·4	1·3	70·5	...	10·00	3·00	10·00	5 50	1·50	...	...	4·8	5·3	14	1·92	...
48·5	·341	3·8	1·4	73·0	...	7·50	3·00	10·75	8·25	1·50	...	...	5·2	5·7	21	3·75	...
54·8	·428	4·7	2·2	68·7	...	4·75	2·50	11·75	10·50	0·50	...	...	5·5	5·7	15	1·77	...
59·9	·519	5·6	3·1	63·8	...	5·00	2·25	12·25	11·50	0·00	...	...	5·1	5·2	14	3·18	...
56·1	·450	5·0	2·1	70·2	...	9·25	7·75	5·00	9·00	0·00	...	...	6·1	5·1	14	3·04	...
53·6	·411	4·6	1·9	70·8	...	3·00	0·00	7·50	19·50	0·00	...	...	5·5	3·5	10	1·64	...
49·5	·354	4·0	0·6	87·0	...	3·50	5·75	11·25	10·50	0·00	...	...	7·0	4·1	21	3·79	...
42·7	·274	3·1	0·6	86·0	...	4·00	1·75	13·25	11·00	0·00	...	...	7·9	4·9	24	5·30	...
40·7	·254	2·9	0·4	88·0	...	3·50	4·75	14·25	8·50	0·00	...	...	6·9	4·5	19	5·16	...
48·0	·343	3·8	1·3	78·0	...	63·50	34·75	137·25	125·50	5·00	...	...	5·8	4·9	210	35·45	...

Long. 0° 32′ E. Height above Sea 160 feet.

49·1	·248	2·8	0·3	92·8	544·8	2·50	1·25	18·50	3·75	5·00	...	239·6	6·4	4·7	20	4·20	4·09*
44·5	·294	3·4	0·3	93·7	541·8	2·00	2·50	22·00	2·00	0·50	...	216·8	5·9	4·0	16	1·16	1·11
45·1	·300	3·4	0·4	90·9	540·8	4·75	3·50	13·75	7·00	2·00	...	193·7	5·1	4·0	15	1·23	1·67
48·7	·345	3·9	0·6	86·7	537·0	7·25	4·50	10·25	8·00	0·00	...	211·2	4·9	4·0	15	1·40	1·34
50·2	·365	4·1	0·9	83·3	533·9	7·25	3·25	8·75	11·25	0·50	...	181·0	5·6	3·3	15	3·17	3·11
60·2	·523	5·8	1·0	85·8	523·7	2·25	2·25	14·50	9·50	1·50	...	173·6	5·5	3·6	15	2·20	2·17
65·9	·637	6·9	1·2	84·5	517·4	4·00	4·00	13·50	8·50	1·00	...	125·8	4·7	3·0	14	2·69	2·65
60·9	·535	5·9	0·8	88·1	524·8	8·50	8·75	6·50	6·25	1·00	...	180·0	5·1	4·4	14	1·39	1·85
58·4	·489	5·4	0·8	87·4	525·3	1·50	0·50	12·75	14·75	0·50	...	214·9	4·7	4·5	11	1·09	1·05
49·2	·351	4·0	0·4	90·9	534·2	1·75	4·75	16·75	5·75	2·00	...	151·6	6·5	2·5	24	4·11	4·05
43·1	·279	3·2	0·4	90·2	540·6	3·75	0·50	16·75	9·00	0·00	...	281·5	6·5	3·0	23	4·26	4·19
40·6	·254	2·9	0·4	88·0	541·0	1·50	3·00	17·75	7·75	1·00	...	255·6	6·8	2·9	21	4·69	4·63
50·6	·385	4·3	0·6	88·5	534·6	47·00	38·75	171·75	93·50	15·00	...	202·1	5·6	3·6	203	32·09	31·91

* 30 Feet above the ground.

Appendix

COLCHESTER. Lat. 51° 53′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Mean				Maximum in Sun's rays.	Minimum on Grass.	Hygrometer.	
							Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.			Dry Bulb.	Wet Bulb.
January	29·509	30·017	28·448	52·8	23·9	28·9	46·3	31·5	14·8	38·9	53·5	30·8	41·6	40·3
February	29·696	30·054	29·382	55·6	27·7	27·9	51·0	35·2	15·8	43·1	66·2	33·9	46·0	44·2
March	29·666	30·188	29·133	61·4	22·5	38·9	54·3	33·4	20·9	43·8	91·1	30·9	48·3	45·0
April	29·766	30·319	28·982	71·3	27·0	44·3	59·9	36·5	23·4	48·2	108·2	33·9	53·5	48·6
May	29·812	30·241	29·379	74·4	29·2	45·2	64·0	39·0	25·0	51·5	107·2	36·0	57·8	51·8
June	29·771	30·151	29·316	83·7	36·6	47·1	71·7	46·5	25·2	59·1	121·9	44·4	65·3	58·7
July	29·786	30·084	29·541	90·1	40·4	49·7	78·5	52·4	26·1	65·4	127·0	47·9	71·1	64·2
August	29·828	30·162	29·351	79·0	41·1	37·9	73·0	50·0	23·0	61·5	118·1	48·3	66·0	60·1
September	29·697	30·157	29·216	81·4	29·4	52·0	68·3	45·7	22·6	57·0	107·8	44·8	62·6	57·2
October... ...	29·574	30·221	29·182	68·5	28·3	40·2	57·4	38·4	19·0	47·9	74·6	36·7	52·5	50·0
November	29·546	30·148	28·841	63·0	28·5	34·5	51·6	35·1	16·5	43·3	62·0	34·0	46·6	44·7
December	29·460	29·857	29·781	54·6	24·6	30·0	48·2	33·3	14·9	40·7	53·5	32·2	43·5	42·3
Yearly Sums, Means, and Totals ...	29·676	30·133	29·212	69·6	29·9	39·7	60·3	39·7	20·6	50·0	90·9	37·8	54·6	50·6

DEVONPORT. Lat. 50° 17′ N.

January	29·374	29·867	28·457	56·3	26·6	29·7	51·0	34·8	16·2	42·9	72·3	31·3	45·9	44·1
February	29·518	30·154	29·230	57·4	30·2	27·2	53·6	38·7	14·9	46·1	79·0	34·4	49·1	46·9
March	29·536	30·081	28·959	61·8	21·6	40·2	55·2	37·4	17·8	46·3	88·9	33·1	49·6	46·6
April	29·697	30·281	28·795	68·0	25·4	42·6	58·8	35·9	22·9	47·3	102·8	30·2	53·0	48·7
May	29·709	30·158	29·232	73·0	29·2	43·8	63·4	38·5	24·9	50·9	108·7	33·5	56·4	51·4
June	29·686	30·050	29·152	79·8	37·2	42·6	69·0	46·1	22·9	57·5	114·0	42·0	61·8	57·2
July	29·687	30·050	29·437	82·4	43·4	39·0	74·2	51·0	23·2	62·6	119·2	47·6	68·8	62·6
August	29·761	30·126	29·232	82·4	37·8	44·6	73·3	49·1	24 2	61·2	119·0	44·0	66·8	61·0
*September ...	29·664	30·152	28·545	75·3	28·6	46·7	67·4	46·4	21·0	56·9	103·1	42·5	61·8	57·3
October... ...	29·440	30·097	28·833	62·2	26·0	36·2	59·5	37·9	21·6	48·7	93·4	34·6	52·9	49·9
November ...	29·479	30·166	28 513	61·4	29·0	32·4	53·9	38·0	15·9	45·9	76·8	33·4	49·1	46·8
December ...	29·349	29·819	28·676	56·2	21·5	34·7	52·2	36·1	16·1	44·1	68·8	31·6	46·4	44·1
Yearly Sums, Means, and Totals ...	29·575	30·083	29·005	68·0	29·7	38·3	60·9	40·8	20·1	50·9	95·5	36·5	55·1	51·4

DOVER. Lat. 51° 8′ N.

January	...	...	...	50·0	28·0	22·0	45·3	33·5	11·8	39·4	...	...	42·6	40·5
February	...	...	...	54·0	30·0	24·0	48·7	35·2	13·5	41·9	...	...	45·3	43·3
March	...	...	...	57·5	23·5	34·0	50·7	35·0	15·7	42·8	...	...	46·8	43·7
April	...	...	...	64·0	29·5	34·5	56·1	37·8	18·3	46·9	...	...	51·5	47·7
May	...	...	...	69·5	32·5	37·0	58·9	40·8	18·1	49·8	...	...	55·3	52·0
June	...	...	...	80·5	41·0	39·5	67·2	47·4	19·8	57·3	...	...	62·9	58·4
July	...	...	...	86·0	46·0	40·0	73·9	52·1	21·8	63·0	...	...	68·5	63·4
August	...	...	...	74·0	44·0	30·0	68·7	49·3	19·4	59·0	...	...	64·4	60·2
September	...	...	...	76·5	31·0	45·5	65·0	45·7	19·3	55·3	...	...	61·0	56·2
October... ...	...	...	...	64·0	31·0	33·0	56·4	40·3	16·1	48·3	...	...	53·4	50·2
November	...	...	...	57·0	25·0	32·0	49·7	36·1	13·6	42·9	...	...	44·4	47·1
December	...	...	...	52·0	25·0	27·0	47·3	34·8	12·5	41·0	...	...	44·4	41·6
Yearly Sums, Means, and Totals ...	...	...	...	65·4	32·2	33·2	57·3	40·7	16·6	49·0	...	...	53·4	50·4

* September.—Observations extend over 29 days only.

No. XVI—*continued.*

Long. 0° 54′ E. Height above Sea 109 feet.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.											
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.					Amount of Rain fall.	
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, Days.	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	On the Ground.	20 Feet above the Ground.
												Miles.				Inches	Inches
39·7	·236	2·7	0·3	90·2	545·3	2·75	3·25	13·75	11·25	0·00	...	*	8·0	2·3	21	3·27	3·11
42·1	·269	3·1	0·5	87·4	543·8	1·50	5·25	13·75	8·50	0·00	...	177·7	8·3	2·0	18	0·94	0·87
41·4	·261	3·0	0·9	77·2	541·8	4·50	6·50	10·00	10·00	0·00	...	182·1	7·0	2·9	17	2·64	2·36
43·7	·285	3·2	1·4	69·5	536·9	3·00	4·75	8·50	8·75	0·00	...	189·0	7·1	4·9	13	1·28	1·17
46·4	·316	3·6	1·8	65·8	533·1	5·25	5·50	5·50	9·75	0·00	...	148·2	7·9	3·8	12	3·04	2·92
53·3	·407	4·5	2·4	65·3	524·1	2·25	4·00	10·50	13·25	0·00	...	169·0	6·9	4·0	13	2·81	2·66
58·9	·499	5·4	2·9	65·4	518·1	4·50	6·00	11·25	9·25	0·00	...	134·8	6·4	4·4	16	2·73	2·61
55·3	·437	4·8	2·2	68·5	524·3	6·00	8·50	8·75	7·75	0·00	...	154·8	7·4	4·2	14	1·42	1·32
52·6	·397	4·4	1·9	70·0	525·6	2·50	1·75	8·75	17·00	0·00	...	176·4	7·3	4·1	11	1·76	1·69
47·5	·329	3·7	0·7	83·0	534·4	3·75	6·50	10·50	10·25	0·00	...	156·3	7·8	1·9	20	3·23	2·99
42·6	·273	3·1	0·5	86·7	540·2	4·00	2·50	11·00	12·50	0·00	...	179·8	7·3	1·8	19	3·57	3·33
40·9	·256	2·9	0·3	90·4	540·2	4·25	4·75	14·00	8·00	0·00	...	152·8	7·7	2·6	22	3·08	2·88
45·9	·330	3·7	1·3	77·4	533·9	49·25	59·25	126·25	126·25	0·00	...	165·5	7·4	3·2	196	29·77	28·91

Long. 4° 5′ W. Height above Sea 35 feet.

42·0	·267	3·0	0·5	86·5	538·0	4·25	4·00	10·50	11·75	0·50	...	210·1	6·5	4·0	29	3·40	7·79
44·5	·295	3·4	0·6	84·7	537·1	2·50	7·75	12·00	6·75	0·00	...	274·5	7·0	4·0	24	6·36	5·94
43·4	·283	3·2	0·8	79·6	536·9	5·75	6·75	9·75	8·75	0·00	...	248·5	7·0	5·5	22	3·92	3·46
43·1	·292	3·3	1·2	72·5	536·2	3·75	6·75	11·25	8·25	0·00	...	200·4	5·5	5·0	12	2·03	1·86
46·7	·321	3·6	1·5	70·0	544·7	7·00	3·75	8·50	11·75	0·00	...	188·0	6·5	6·0	17	1·39	1·00
53·2	·406	4·5	1·7	74·0	526·1	4·25	3·25	10·75	11·75	0·00	...	206·1	6·5	5·5	19	3·88	3·61
57·4	·478	5·3	2·4	67·0	518·8	5·00	6·75	10·25	8·00	1·00	...	164·6	6·0	5·0	14	3·16	2·93
56·4	·454	5·0	2·2	69·8	522·2	7·00	6·00	9·25	8·75	0·00	...	183·7	6·1	5·3	7	1·30	1·17
53·4	·409	4·5	1·6	74·5	525·7	4·50	1·25	9·50	13·75	0·00	...	208·3	5·5	5·0	20	3·06	3·04
47·0	·323	3·7	0·9	80·9	531·4	7·75	3·25	9·50	10·50	0·00	...	233·5	6·0	4·0	23	6·82	6·10
44·3	·292	3·3	0·7	84·0	536·4	6·00	1·50	8·75	13·75	0·00	...	282·8	6·7	4·7	23	6·87	6·39
41·5	·262	3·0	0·6	83·9	537·0	3·75	6·00	10·00	11·25	0·00	...	243·9	7·4	3·4	25	8·70	8·17
47·7	·340	3·8	1·2	77·3	532·6	61·50	57·00	120·00	125·00	1·50	...	220·3	6·4	4·8	235	55·89	51·47

Long. 1° 19′ E. Height above Sea 325 feet.

38·0	·229	2·6	0·5	84·3	...	4·00	4·25	12·25	10·50	0·00	...	...	7·0	4·4	20	2·41	...
41·0	·257	2·9	0·5	85·3	...	2·75	2·25	14·25	9·75	0·00	...	...	5·6	4·5	19	1·20	...
40·2	·250	2·9	0·7	79·1	...	5·50	9·50	8·50	7·50	0·00	...	...	4·7	4·1	14	2·16	...
43·8	·287	3·3	1·0	75·7	...	3·75	10·50	10·50	5·25	0·00	...	...	4·9	4·9	15	1·62	...
48·8	·346	3·9	1·1	79·5	...	2·75	7·50	9·75	11·00	0·00	...	...	5·1	4·6	14	3·63	...
54·6	·427	4·8	1·6	74·5	...	2·75	3·75	8·50	12·50	2·50	...	...	4·3	4·7	13	2·31	...
59·4	·507	5·6	2·1	72·5	...	2·25	5·75	10·75	12·25	0·00	...	...	3·7	4·3	12	3·26	...
56·7	·462	5·1	1·6	76·0	...	4·50	8·75	5·25	12·50	0·00	...	...	4·5	4·6	14	1·72	...
52·1	·388	4·4	1·6	73·0	...	4·75	1·50	6·25	17·50	0·00	...	...	4·3	4·2	11	1·62	...
47·0	·322	3·6	1·0	78·8	...	2·75	3·50	12·50	12·25	0·00	...	...	6·2	4·5	19	4·81	...
41·4	·258	3·0	0·7	81·2	...	7·00	2·25	7·75	13·00	0·00	...	...	5·7	3·9	25	10·03	...
38·3	·232	2·6	0·7	78·8	...	3·25	2·00	11·75	14·00	0·00	...	...	5·9	4·0	20	5·35	...
46·8	·330	3·7	1·1	76·5	...	46·00	61·50	118·00	138·00	2·50	...	...	5·2	4·4	196	40·12	...

* Out of Order.

Appendix

GUERNSEY. Lat. 49° 33′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Mean of all the highest.	Mean of all the lowest.	Mean Daily Range.	Mean Approximate Temperature.	Maximum in Sun's rays.	Minimum on Grass.	Hygrometer. Dry Bulb.	Hygrometer. Wet Bulb.
January	29·404	29·948	28·591	52·4	35·0	17·4	48·0	39·1	8·9	43·5	66·6	33·5	45·3	43·4
February	29·541	29·900	29·222	53·4	36·0	17·4	50·3	41·7	8·6	46·0	78·8	36·4	47·4	45·7
March	29·546	30·030	29·025	57·8	29·5	28·3	51·9	40·5	11·4	46·2	98·6	35·8	48·1	45·8
April	29·663	30·219	28·781	64·8	35·5	29·3	55·5	42·0	13·5	48·7	111·8	36·8	50·8	47·8
May	29·690	30·152	29·237	67·4	31·0	36·4	57·7	42·9	14·8	50·3	116·9	39·0	53·2	50·2
June	29·702	30·038	29·251	83·4	41·6	41·0	65·4	49·9	15·5	57·6	123·9	44·4	59·9	57·0
July	29·631	30·021	29·142	83·6	50·6	33·0	71·8	55·2	16·6	63·5	131·1	49·3	65·5	62·5
August...	29·394	29·938	29·077	78·0	...	...	71·9	...	...	...	124·2	48·8	64·6	61·1
September	29·368	29·994	29·043	78·5	...	...	67·8	...	...	...	120·8	51·1	61·3	59·2
October	29·243	29·965	29·908	64·5	...	...	58·1	...	...	...	106·1	44·2	53·1	50·5
November	29·184	30·012	28·163	68·4	...	...	59·1	...	...	...	73·1	38·4	49·8	47·7
December	29.091	29·347	28·205	56·4	35·0	21·4	52·1	41·0	11·1	46·5	68·4	35·6	47·6	45·6
Yearly Sums, Means, and Totals ...	29·465	29·130	28·870	67·4	...	...	59·1	...	...	...	103·4	41·1	53·9	51·5

JERSEY. Lat. 49° 11′ N.

January	29·378	29·902	28·630	54·2	29·5	24·7	49·2	34·4	14·8	41·8	...	...	45·4	43·5
February	29·501	29·834	29·192	59·5	31·1	28·4	53·3	39·0	14·3	46·1	...	...	47·9	46·0
March	29·492	29·970	28·928	62·2	25·8	36·4	56·2	37·2	19·0	46·7	...	...	49·9	48·2
April	29·598	30·130	28·784	71·2	31·0	40·2	61·7	39·1	22·6	50·4	...	...	54·2	50·8
May	29·630	30·026	29·165	72·6	30·0	42·6	63·3	40·8	22·5	52·0	...	...	56·1	52·4
June	29·636	29·909	29·233	90·2	42·6	47·6	72·4	48·9	23·5	60·6	...	...	63·3	61·8
July	29·709	29·917	29·477	92·4	50·1	42·3	79·4	53·7	25·7	66·5	...	...	68·9	64·4
August...	29·732	30·498	29·342	86·0	46·0	40·0	75·1	52·3	22·8	63·7	...	...	66·1	61·2
September	29·705	30·095	29·280	83·2	30·0	53·2	71·2	47·8	23·4	59·5	...	...	62·4	58·2
October	29·530	30·036	29·076	70·0	20·0	50·0	62·0	39·0	23·0	50·5	...	...	53·1	50·1
November	29·559	30·101	28·794	64·0	23·0	41·0	56·1	33·6	22·5	44·8	...	...	48·7	46·5
December	29·494	29·950	28·840	55·0	31·0	24·0	51·1	36·6	14·5	43·8	...	...	46·7	44·5
Yearly Sums, Means, and Totals ...	29·612	30·031	29·062	71·7	32·5	39·2	62·6	41·9	20·7	52·2	...	...	55·2	52·3

NETLEY. Lat. 50° 51′ N.

January	29·768	30·149	28·676	53·0	24·4	28·6	48·5	35·0	13·5	41·7	67·2	33·2	43·3	41·4
February	29·757	30·130	29·454	56·0	29·0	27·0	52·1	38·9	13·2	45·5	80·9	37·0	46·7	44·6
March	29·757	30·271	29·219	60·5	21·5	39·0	53·8	37·2	16·6	45·5	88·4	35·4	48·6	45·6
April	29·855	30·436	28·924	71·0	27·0	44·0	58·7	38·3	20·4	48·5	100·9	36·4	53·0	49·1
May	29·867	30·338	29·376	74·0	30·0	44·0	62·0	40·2	21·8	51·1	101·0	38·3	55·9	50·7
June	29·858	30·255	29·260	82·0	34·0	48·0	69·9	46·9	23·0	58·4	104·9	45·3	63·1	58·1
July	29·884	30·211	29·624	84·2	46·0	38·2	75·9	54·7	21·2	65·3	129·2	52·7	70·0	63·6
August...	29·918	30·286	29·362	80·6	11·0	69·6	73·3	51·9	21·4	62·6	129·8	50·1	67·1	61·0
September	29·822	30·285	29·345	80·5	29·0	51·5	68·0	49·4	18·6	58·7	119·8	47·3	62·0	57·3
October...	29·652	30·272	29·122	64·5	30·0	34·5	59·2	41·2	18·0	50·2	107·0	38·5	52·6	49·8
November	29·643	30·301	28·813	63·6	29·8	33·8	52·0	38·8	13·2	45·4	81·6	37·1	46·9	45·3
December	29·514	30·065	28·762	53·8	23·5	30·3	49·0	37·5	11·5	43·2	77·3	35·9	45·0	43·1
Yearly Sums, Means, and Totals ...	29·774	30·249	29·161	68·6	27·9	40·7	60·2	42·5	17·7	51·3	99·0	40·6	54·2	50·7

No. XVI—*continued.*

Long. 2° 40′ W. Height above Sea 248 feet.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.											
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.					Amount of Rain fall.	
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, Days.	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	On the Ground.	30 Feet above the Ground.
											lbs. per sq. foot.	Miles.				Inches.	Inches.
41·2	·259	2·9	0·5	86·0	538·2	2·50	0·00	17·00	11·50	0·00	...	475·9	7·1	5·2	23	4·85	...
43·8	·286	3·3	0·5	88·5	539·2	2·00	3·50	15·75	7·75	0·00	...	386·0	7·7	6·0	21	2·32	...
43·3	·280	3·2	0·6	84·0	538·7	6·00	4·25	11·75	9·00	0·00	...	370·3	6·2	6·5	20	3·83	...
44·7	·296	3·4	0·8	80·0	537·8	10·50	6·25	7·00	6·25	0·00	...	373·9	4·9	4·2	13	2·19	...
47·2	·325	3·6	0·9	80·0	535·6	11·50	2·50	2·00	15·00	0·00	...	354·4	5·7	6·0	21	3·45	...
54·5	·424	4·7	1·1	82·6	528·2	4·50	4·00	3·75	17·75	0·00	...	351·1	6·0	7·4	18	2·70	...
60·0	·520	5·7	1·2	83·0	520·8	7·25	6·25	8·00	9·50	0·00	...	251·7	5·4	6·1	17	3·48	...
58·2	·487	5·3	1·4	79·6	517·8	7·75	12·00	5·75	5·50	0·00	...	224·7	4·1	6·5	8	1·95	...
57·4	·471	5·2	0·8	87·4	520·6	1·75	0·25	8·50	19·50	0·00	...	341·5	4·2	6·2	16	3·80	...
47·9	·333	3·7	0·8	82·4	527·6	3·50	2·50	11·75	13·25	0·00	...	396·5	5·4	6·7	26	8·25	...
45·5	·305	3·5	0·5	86·1	530·1	4·25	4·25	11·00	10·50	0·00	...	486·9	6·0	7·0	28	7·68	...
43·4	·281	3·2	0·6	86·6	530·9	2·00	5·75	13·50	9·75	0·00	...	432·5	6·3	6·8	23	5·33	...
48·9	·356	4·0	0·8	83·8	531·1	63·50	51·50	115·75	135·25	0·00	...	370·4	5·7	6·2	234	50·43	...

Long. 2° 6′ W. Height above Sea 72½ feet.

41·3	·260	3·0	0·5	86·1	538·7	3·00	1·50	16·00	8·00	2·50	...	...	7·2	6·0	18	3·63	...
43·9	·286	3·2	0·6	86·7	537·9	1·50	3·25	17·25	6·00	1·00	...	...	6·3	5·3	8	1·02	...
46·4	·315	3·6	0·5	88·1	535·6	3·75	6·75	16·25	4·25	0·00	...	...	5·7	5·4	12	1·92	...
47·5	·327	3·7	1·0	77·8	532·8	9·75	4·50	10·50	5·25	0·00	...	...	4·9	5·0	6	1·41	...
48·9	·349	3·9	1·1	76·9	531·3	10·00	1·25	6·00	13·25	0·00	...	...	5·4	6·0	14	3·62	...
60·6	·529	5·9	0·6	91·3	522·9	3·50	1·75	12·75	11·00	1·00	...	...	5·4	6·8	14	2·06	...
60·8	·534	5·8	2·0	75·5	518·8	5·00	10·00	7·50	7·50	1·00	...	...	3·4	6·5	11	5·38	...
57·3	·469	5·2	1·9	73·6	522·3	7·50	5·50	8·75	6·25	5·00	...	...	2·3	5·2	6	1·30	...
54·6	·428	4·7	1·5	76·0	525·7	4·00	1·75	13·00	7·25	4·00	...	...	4·0	7·0	12	2·36	...
47·1	·323	3·6	0·9	80·0	532·8	4·00	7·50	12·25	4·75	2·50	...	...	4·3	7·4	20	6·57	...
44·1	·291	3·3	0·6	84·6	538·2	5·50	3·50	15·00	6·00	0·00	...	...	5·0	6·5	21	5·26	...
42·0	·268	3·1	0·6	84·6	539·3	5·25	6·50	13·75	5·50	0·00	...	...	4·5	6·3	18	4·69	...
49·6	·365	4·1	9·8	74·4	531·3	63·25	57·75	149·00	85·00	15·00	...	...	4·8	6·1	160	39·22	...

Long. 1° 20′ W. Height above Sea 47 feet.

39·1	·239	2·7	0·5	85·1	548·2	5·75	2·00	11·50	11·75	0·00	...	269·0	7·5	3·5	22	6·12	5·00
42·2	·270	3·1	0·6	85·3	544·1	2·50	3·50	12·50	10·50	0·00	...	248·0	8·0	4·0	17	2·06	1·58
42·4	·271	3·1	0·8	79·6	543·0	6·50	5·50	10·00	9·00	0·00	...	233·0	7·0	3·5	13	2·61	2·07
43·2	·279	3·1	1·4	69·5	539·1	8·75	3·25	8·50	9·50	0·00	...	223·0	5·5	5·0	9	1·25	1·01
45·9	·312	3·5	1·5	69·0	536·3	8·50	3·75	5·75	13·00	0·00	...	219·0	7·0	3·0	15	2·27	1·88
53·9	·416	4·6	1·8	72·1	528·2	2·75	2·00	12·00	13·25	0·00	...	254·0	7·0	3·5	17	2·96	2·25
58·7	·495	5·4	2·6	67·4	520·9	4·75	1·00	13·75	11·50	0·00	...	217·1	5·6	4·5	14	3·51	3·26
56·1	·452	5·0	2·3	67·5	524·7	6·25	5·50	8·50	10·75	0·00	...	188·4	5·5	4·7	11	1·45	1·30
53·3	·407	4·5	1·7	73·5	528·5	8·25	0·75	6·25	19·75	0·00	...	272·0	6·0	4·5	12	1·86	1·63
47·0	·323	3·7	0·8	81·8	535·5	6·00	4·75	9·25	11·00	0·00	...	214·0	6·5	5·0	25	5·17	4·29
43·5	·283	3·2	0·5	88·8	541·7	5·00	0·75	10·25	14·00	0·00	...	340·0	7·5	7·5	22	4·37	3·41
40·9	·255	2·9	0·5	85·7	541·6	4·50	2·25	11·00	13·25	0·00	...	279·0	7·0	6·0	23	5·02	4·08
47·2	·333	3·7	1·2	77·1	536·0	64·50	35·00	119·25	147·25	0·00	...	246·4	6·7	4·5	200	38·65	31·76

Appendix

PARKHURST, ISLE OF WIGHT. Lat. 50° 45′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
							Mean						Hygrometer.	
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.	Maximum in Sun's rays.	Minimum on Grass.	Dry Bulb.	Wet Bulb.
January*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
February	...	...	...	60·5	30·3	30·2	56·3	38·3	18·0	47·3	69·0	36·0	48·4	45·5
March	...	...	...	59·2	21·0	38·2	52·4	35·3	17·1	43·8	79·1	33·9	48·0	44·5
April	...	...	...	68·2	26·4	41·8	58·0	36·1	21·9	47·0	97·4	33·6	52·7	47·5
May	...	...	...	73·0	28·0	45·0	61·1	39·0	22·1	50·0	105·1	36·6	55·9	50·2
June	...	...	...	84·5	32·5	52·0	68·5	45·1	23·4	56·8	110·1	42·0	62·7	57·4
July	...	...	...	84·2	47·0	37·2	75·6	53·6	22·0	64·6	123·3	51·3	69·2	63·7
August	...	...	...	83·2	43·0	40·2	72·1	52·2	19·9	62·1	120·7	49·5	66·1	60·5
September	...	...	..	79·2	32·6	46·6	66·8	49·8	17·0	58·3	103·3	45·6	61·8	57·4
October... ...	...	...	...	65·0	32·9	32·1	57·0	41·3	15·7	49·1	76·5	37·4	52·5	49·7
November	...	...	...	63·0	30·3	32·7	51·6	40·4	11·2	46·0	65·4	36·1	47·4	45·1
December	...	...	...	64·0	26·2	37·8	52·6	39·3	13·3	45·9	61·4	35·6	45·6	43·2
Yearly Sums, Means, and Totals ...	...	...	...	71·3	31·9	39·4	61·1	42·8	18·3	51·9	91·9	39·8	55·5	51·3

PORTSMOUTH. Lat. 50° 45′ N.

January	29·659	30·207	28·753	59·4	27·4	32·0	48·6	35·1	13·5	41·8	60·1	30·4	44·0	41·8
February	29·823	30·172	29·498	55·4	32·8	22·6	50·8	39·0	11·8	44·9	67·0	35·2	47·3	45·0
March	29·818	30·335	29·296	58·0	24·8	33·2	52·2	37·6	14·6	44·9	88·2	33·9	48·0	44·6
April	29·925	30·541	29·001	67·6	30·4	37·2	58·0	38·5	19·5	48·2	102·6	34·6	52·5	47·0
May	29·928	30·389	29·442	72·4	32·0	40·4	61·2	41·1	20·1	51·1	109·1	38·2	55·8	49·7
June	29·930	30·312	29·438	79·0	38·4	40 6	67·9	47·7	20·2	57·8	115·6	43·3	62·4	56·6
July	29·941	30·266	29·689	81·6	45·4	36·2	74·8	53·4	21·4	64·1	122·7	49·2	68·5	62·0
August	29·983	30·304	29·486	78·6	44·4	34·2	71·6	51·5	20·1	61·5	116·6	47·6	66·4	59·2
September	29·885	30·368	29·403	78·2	33·0	45·2	67·3	48·6	18·7	57·9	110·0	40·2	61·9	56·9
October... ...	29·713	30·343	29·192	74·6	31 2	33·4	57·2	40·4	16·8	48·8	95·6	32·8	53·3	49·5
November	29·710	30·357	28·861	58·4	27·4	31·0	51·7	38·3	13·4	45·0	71·7	31·6	48·2	45·5
December	29·693	30·060	28·784	56·2	24·8	31·4	49·4	36·5	12·9	42·9	65·6	29·9	45·9	43·6
Yearly Sums, Means, and Totals ...	29·826	30·054	29·237	67·4	32·6	34·8	59·2	42·3	16·9	50·7	92·9	37·2	54·5	50·1

PRESTON. Lat. 53° 45′ N.

January	...	...	...	56·4	20·2	36·2	45·3	26·7	18·6	36·0	...	...	40·8	39·0
February	...	...	...	54·9	25·4	29·5	49·2	33·3	15·9	41·2	...	...	44·6	42·6
March	...	...	...	59·5	18·8	40·7	51·9	33·1	18·8	42·5	...	...	45·6	42·9
April	...	...	...	63·8	23·0	40·8	54·1	33·7	20·4	43·9	...	...	49·4	45·9
May	...	...	...	67·2	29·0	38·2	57·2	36·8	20·4	47·0	...	...	53·2	49·3
June	...	...	...	83·0	34·0	49·0	65·7	43·8	21·9	54·7	...	...	61·1	56·9
July	...	...	...	85·0	35·5	49·5	72·0	48·8	23·2	60·4	...	...	66·8	62·1
August... ...	...	...	...	82·0	39·8	42·2	68·2	47·0	21·2	57·6	...	...	63·4	59·3
September	...	...	...	72·2	27·8	44·4	61·9	44·4	17·5	53·1	...	...	58·0	54·7
October	...	...	...	61·4	24·8	36·6	54·1	35·5	18·6	44·8	...	...	49·6	47 6
November	...	...	...	†	†	†	†	†	†	†	...	...	46·4	44·4
December	...	...	...	53·6	38·0	15·6	46·3	30·3	16·0	38·3	...	...	42·6	40·9
Yearly Sums, Means, and Totals ...	...	...	...	67·2	28·8	38·4	56·9	37·6	19·3	47·2	...	...	51·8	48·3

* Return useless.

† Maximum in air thermometer out of order.

No. XVI—*continued.*

Long. 1° 16′ W. Height above Sea 200 feet.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.											
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.					Amount of Rain fall.	
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, Days.	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	On the Ground.	Feet above the Ground.
...	...	...	...	...	...	...	...	...	...	...	lbs. per sq. foot	Miles	...	...	...	Inches	Inches
42·3	·277	3·2	0·7	81·6	...	8·00	8·25	5·50	7·25	0·00	...	...	5·6	5·5	18	5·89	...
40·6	·253	2·9	0·9	76·0	...	5·00	6·75	9·00	10·25	0·00	...	...	6·1	6·6	16	5·04	...
42·3	·270	3·1	1·4	68·0	...	8·50	8·75	6·75	6·00	0·00	...	...	6·4	6·8	9	1·74	...
44·9	·300	3·4	1·6	66·5	...	5·75	6·00	6·00	13·25	0·00	...	...	6·2	5·7	18	4·00	...
52·9	·402	4·4	1·9	70·5	...	2·00	2·50	8·00	17·50	0·00	...	...	5·9	5·7	16	4·25	...
59·4	·505	5·6	2·3	70·7	...	1·75	5·00	8·75	9·50	6·00	...	...	4·8	6·3	*	*	...
56·0	·448	4·9	2·1	70·1	...	4·00	9·50	5·00	10·00	2·50	...	...	5·1	6·5	*	*	...
53·6	·412	4·4	1·6	75·0	...	3·25	0·75	5·50	18·00	2·50	...	...	6·3	7·5	*	*	...
46·9	·322	3·7	0·8	81·7	...	3·25	4·25	7·00	11·50	5·00	...	...	6·3	6·5	19	6·55	...
42·6	·272	3·1	0·6	84·3	...	4·25	2·25	6·50	12·50	4·50	...	...	7·0	7·2	22	5·84	...
40·5	·252	2·9	0·6	82·8	...	3·00	4·00	8·00	14·00	2·00	...	...	6·8	6·1	25	6·10	...
47·5	·338	3·8	1·2	75·2	...	48·75	58·00	76·00	129·75	22·50	...	...	6·5	6·4	...	...	...

Long. 1° 5′ W. Height above Sea 20 feet.

																	†
39·2	·240	2·7	0·5	82·6	545·4	3·75	1·25	18·25	7·75	0·00	...	128·2	7·4	2·3	22	5·43	5·11
42·5	·271	3·1	0·6	84·2	544·7	1·75	6·50	15·25	5·50	0·00	...	100·7	6·9	1·9	15	1·66	1·54
40·9	·255	2·9	0·9	76·6	545·0	9·50	5·75	8·00	7·75	0·00	...	105·9	6·5	2·2	12	1·78	1·68
41·4	·261	2·9	0·5	66·5	541·2	8·00	4·50	9·50	8·00	0·00	...	79·4	5·9	1·9	13	1·24	1·17
44·0	·291	3·2	1·7	65·3	537·5	4·75	4·00	9·50	12·75	0·00	...	151·9	6·3	2·8	15	2·50	2·35
51·6	·384	4·2	2·0	68·4	529·9	0·75	2·00	14·00	13·25	0·00	...	185·2	6·9	3·4	13	2·21	2·01
56·9	·463	5·1	2·5	65·5	523·7	2·25	6·50	13·00	9·25	0·00	...	136·2	5·6	3·1	17	3·72	3·50
53·4	·408	4·5	2·6	63·2	526·8	5·00	5·75	10·00	10·25	0·00	...	169·5	6·3	2·5	11	1·68	1·55
52·6	·397	4·4	1·8	72·0	529·6	2·00	1·50	8·75	17·75	0·00	...	214·5	6·8	2·4	17	1·92	1·79
45·7	·307	3·5	1·1	75·5	536·0	4·75	4·50	10·00	11·75	0·00	...	195·9	7·3	2·2	22	4·90	4·61
42·5	·272	3·1	0·7	81·3	542·1	5·25	2·25	12·00	10·50	0·00	...	272·6	7·9	2·7	24	4·78	4·50
41·0	·258	2·9	0·6	83·8	542·1	3·75	4·75	12·25	10·25	0·00	...	245·8	7·7	2·3	25	4·84	4·53
46·0	·317	3·5	1·4	73·7	537·0	51·50	49·25	140·50	124·75	0·00	...	165·5	6·9	2·5	206	36·66	34·34

Long. 2° 40′ W. Height above Sea 220 feet.

36·7	·217	2·5	0·5	85·6	...	9·75	0·50	0·25	20·50	0·00	...	...	7·0	2·4	16	4·09	...
40·3	·250	2·9	0·7	85·2	...	9·00	3·00	1·00	16·00	0·00	...	...	7·2	2·6	13	2·16	...
39·8	·246	2·8	0·7	80·7	...	7·00	6·25	2·50	15·25	0·00	...	...	6·6	2·6	15	4·65	...
42·2	·270	3·0	1·0	76·4	...	10·75	4·50	4·75	10·00	0·00	...	...	5·9	3·6	12	3·00	...
45·4	·304	3·4	1·1	74·8	...	4·25	9·00	3·00	12·25	2·50	...	...	6·1	3·9	15	2·03	...
53·2	·406	4·5	1·5	76·0	...	2·75	1·00	7·75	15·50	3·00	...	...	6·3	3·4	21	4·50	...
58·3	·488	5·4	1·9	74·5	...	1·25	3·50	8·75	16·00	1·50	...	...	6·3	3·3	16	5·88	...
55·8	·447	4·9	1·5	76·9	...	0·75	11·25	2·00	14·00	3·00	...	...	5·7	3·3	16	4·43	...
51·7	·385	4·3	1·1	79·5	...	5·75	5·75	1·50	17·00	0·00	...	...	6·5	3·5	23	6·60	...
45·5	·305	3·5	0·5	86·6	...	6·50	10·00	1·25	12·25	1·00	...	...	6·1	1·7	22	5·54	...
42·1	·269	3·1	0·5	86·0	...	7·00	4·50	2·25	15·75	0·50	...	...	5·8	2·7	18	3·01	...
38·9	·237	2·7	0·4	87·1	...	7·25	7·25	1·50	15·00	0·00	...	...	7·0	2·7	16	3·58	...
45·8	·319	3·6	0·9	80·8	...	72·00	66·50	36·50	179·50	11·50	...	...	6·4	3·0	203	49·47	...

* Out of order.

† 20 feet above.

Appendix

SHEERNESS. Lat. 51° 23′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Mean				Maximum in Sun's rays.	Minimum on Grass.	Hygrometer.	
							Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.			Dry Bulb.	Wet Bulb.
January	...	...	...	56·0	24·0	32·0	46·1	31·8	14·3	38·9	...	...	41·7	41·0
February	...	...	...	56·5	30·0	26·5	51·1	35·9	15·2	43·5	...	...	45·8	44·1
March	...	...	...	64·5	28·5	36·0	53·9	37·6	16·3	45·7	...	...	47·2	45·0
April	...	...	...	73·0	33·5	39·5	60·6	41·2	19·4	50·9	...	...	51·4	47·8
May	...	...	...	75·0	32·0	43·0	63·8	43·5	20·3	53·6	...	...	55·0	50·9
June	...	...	...	84·0	44·0	40·0	72·1	51·6	20·5	61·8	...	...	63·5	58·6
July	...	...	...	86·0	50·5	35·5	76·4	55·6	20·8	66·0	...	...	69·5	64·5
August	...	...	...	78·5	47·0	31·5	69·4	54·7	14·7	62·0	...	...	64·4	60·0
September	...	...	...	80·0	35·5	44·5	67·4	50·7	16·7	59·0	...	...	61·4	57·1
October...	...	...	...	67·5	34·2	33·3	55·8	43·1	12·7	49·5	...	...	52·3	50·2
November	...	...	...	60·7	32·4	28·3	50·6	40·2	10·4	45·4	...	...	46·4	44·6
December	...	...	...	52·6	24·4	28·2	47·4	36·0	11·4	41·7	...	...	43·9	42·6
Sums, Means, and Totals ...	...	...	...	69·5	34·7	34·8	59·5	43·5	16·0	51·5	...	...	53·5	50·5

SHORNCLIFFE. Lat. 51° 5′ N.

January	29·493	29·972	28·586	49·0	30·0	19·0	46·1	37·6	8·5	41·8	66·9	29·9	42·8	41·5
February	29·712	30·079	29·002	52·9	34·0	18·9	49·2	39·4	9·8	44·3	72·5	34·2	44·8	44·0
March	29·676	30·207	29·109	58·0	24·2	33·8	52·3	37·9	14·4	45·1	84·6	30·2	46·8	45·1
April	29·812	30·295	28·980	64·0	30·0	34·0	56·0	40·5	15·5	48·2	90·0	34·0	50·4	48·2
May	29·760	30·214	29·283	70·0	33·0	37·0	59·4	43·3	16·1	51·3	99·7	37·7	53·6	50·3
June	29·761	30·144	28·969	81·0	42·0	39·0	68·2	50·1	18·1	59·1	116·1	46·6	61·9	58·4
July	29·781	30·055	29·535	91·0	47·4	43·6	75·6	56·1	19·5	65·8	125·6	53·6	68·5	63·2
August	29·828	30·172	29·339	88·5	44·0	44·5	71·0	53·5	17·5	62·2	129·3	51·8	64·4	59·6
September	29·750	30·596	29·195	77·5	33·0	44·5	67·1	49·0	18·1	58·0	118·1	49·4	60·7	56·2
October...	29·566	30·196	29·193	68·4	32·0	36·4	58·3	42·1	16·2	50·2	89·3	39·6	52·6	49·9
November	29·528	30·092	28·958	60·0	28·6	31·4	51·0	39·0	12·0	45·0	69·5	37·2	46·6	44·8
December	29·467	29·859	28·681	54·0	28·0	26·0	48·4	37·7	10·7	43·0	59·6	36·4	44·6	43·0
Yearly Sums, Means, and Totals ...	29·678	30·157	29·069	67·8	33·8	34·0	58·5	43·8	14·7	51·2	93·4	40·0	53·1	50·4

WINCHESTER. Lat. 51° 4′ N.

January	...	...	...	54·0	24·0	30·0	46·4	31·1	17·3	39·7	...	...	42·0	40·8
February	...	...	...	58·0	28·0	30·0	52·3	36·5	15·8	44·4	...	...	46·5	44·5
March	...	...	...	62·0	21·0	41·0	55·5	34·7	20·8	45·1	...	...	48·0	45·0
April	...	...	...	72·0	26·0	46·0	59·6	35·3	24·3	47·4	...	...	52·4	48·4
May	...	...	...	77·0	28·0	49·0	63·1	37·5	25·6	50·3	...	...	55·8	51·6
June	...	...	...	87·0	35·0	52·0	70·3	44·5	25·8	57·4	...	...	63·8	60·1
July	...	...	...	86·0	41·0	45·0	77·6	49·6	28·0	63·6	...	...	69·9	63·3
August	...	...	...	83·0	38·0	45·0	73·9	47·1	26·8	60·5	...	...	66·3	59·6
September	...	...	...	79·5	24·5	55·0	65·7	42·9	22·8	54·3	...	...	61·5	56·4
October...	...	...	...	63·0	27·0	36·0	57·5	36·4	21·1	46·9	...	...	51·3	48·6
November	...	...	...	60·5	27·0	33·5	52·8	35·3	17·5	44·0	...	...	46·3	44·6
December	...	...	...	57·0	22·0	35·0	48·9	34·2	14·7	41·5	...	...	43·7	41·9
Yearly Sums, Means, and Totals ...	...	...	...	69·9	28·5	41·4	60·5	38·8	21·7	49·6	...	...	53·9	50·4

No. XVI—*continued.*

Long. 0° 49′ E. Below the Sea 2 feet.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.											
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	In a Cubic Foot of Air.			Mean Weight of Cubic Foot of Air.	Number of Days for mean Direction of Wind.				Number of calm, or nearly calm, Days.	Calculated from Robinson's Anemometer.		Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of days on which Rain fell.	Amount of Rain fall.	
		Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean degree of Humidity.		North.	East.	South.	West.		Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.				On the Ground.	20 Feet above the Ground.
											lbs. per sq. foot	Miles				Inches	Inches
40·2	·249	2·9	0·1	94·4	...	3·25	0·50	15·25	12·00	0·00	...	...	7·2	4·9	23	2·25	...
42·1	·269	3·0	0·5	87·2	...	4·50	1·25	15·00	8·25	0·00	...	...	6·8	5·2	14	0·51	...
42·6	·273	3·2	0·6	84·8	...	9·25	1·25	10·75	9·75	0·00	...	...	5·7	4·6	13	1·91	...
44·1	·290	3·3	1·0	76·8	...	10·50	2·00	6·75	10·75	0·00	...	...	5·4	5·2	13	1·49	...
47·0	·323	3·7	1·2	74·5	...	8·00	2·50	7·00	13·50	0·00	...	...	5·4	4·7	17	2·80	...
54·5	·426	4·7	1·8	73·0	...	3·75	2·75	6·75	16·75	0·00	...	...	5·2	5·8	15	1·72	...
60·6	·527	5·8	2·1	73·1	...	6·00	6·75	5·00	13·25	0·00	...	...	4·9	5·0	14	2·59	...
56·4	·455	5·0	1·7	75·0	...	8·00	7·50	4·25	11·25	0·00	...	...	5·7	5·6	13	2·38	...
53·4	·408	4·5	1·5	75·5	...	2·50	0·25	4·50	22·75	0·00	...	...	10·0	9·7	12	1·00	...
48·1	·338	3·8	0·6	86·2	...	3·00	4·50	14·00	9·50	0·00	...	...	6·4	4·3	23	3·22	...
42·6	·273	3·1	0·5	87·4	...	3·50	4·00	11·00	11·50	0·00	...	...	6·9	5·7	23	3·75	...
41·0	·258	3·0	0·3	89·6	...	3·50	2·25	12·25	13·00	0·00	...	...	7·1	4·2	19	4·00	...
47·7	·341	3·9	1·0	81·4	...	65·75	35·50	112·50	152·25	0·00	...	...	6·4	5·4	199	27·62	...

Long. 1° 10′ E. Height above Sea 220 feet.

39·9	·247	2·9	0·3	89·6	543·5	4·25	2·50	12·00	11·75	0·50	...	583·0	1·4	1·5	25	3·84	2·58
43·0	·278	3·2	0·2	93·6	545·0	1·25	3·75	13·75	10·25	0·00	...	383·1	5·0	4·9	13	1·29	0·95
43·2	·280	3·2	0·5	88·1	542·5	5·50	7·25	6·25	12·00	0·00	...	258 9	4·5	4·8	17	1·60	1·26
45·9	·310	3·5	0·6	85·0	540·9	3·50	4·50	8·00	8·50	0·50	...	291·7	3·6	1·4	14	1·50	1·31
48·1	·335	3·8	0·8	81·2	536·4	7·50	4·75	6·25	11·00	1·50	...	305·9	3·6	6·6	13	2·43	2·29
55 4	·440	4·8	1·3	79·9	527·1	3·75	3·25	9·00	13·00	1·00	...	341·5	3·1	5·5	14	2·06	1·93
59·0	·500	5·9	2·1	71·5	520·6	4·00	6·75	5·00	13·75	1·50	...	153·1	3·0	4·0	14	3·46	2·83
55·6	·445	4·9	1·8	73·4	526·0	5·75	9·25	2·25	13·75	0·00	...	347·5	4·0	3·8	14	2·55	1·86
52·3	·392	4·4	1·5	73·7	528·6	1·75	1·75	5·75	20·75	0·00	...	380·4	3·9	5·8	9	2·71	1·57
47·2	·326	3·7	0·8	82·4	534·1	5·50	6·25	10 50	8·75	0·00	...	378·3	6·7	5·5	18	4·97	3·86
42·8	·275	3·1	0·5	87·4	540·0	5·75	2·50	9·25	12·50	0·00	...	400·0	7·9	5·6	19	9·60	8·53
41·1	·258	2·9	0·4	87·8	541·1	3·25	3·00	12·25	12·50	0·00	...	210·9	6·9	6·9	14	5·52	4·91
47·8	·340	3·8	0·9	82·8	535·3	56·75	55·50	100·25	148·50	5·00	...	317·8	4·9	4·7	186	41·33	33·93

Long. 1° 20′ W. Height above Sea 214 feet.

39·3	·241	2·8	0·3	90·6	...	7·00	4·50	14·50	5·00	0·00	...	...	6·2	3·6	23	6·46	...
42·2	·270	3·1	0·5	86·0	...	2·00	5·00	18·00	4·00	0·00	...	...	6·4	3·3	23	2·17	...
41·7	·263	3·0	0·8	79·0	...	10·00	10·50	7·00	3·50	0·00	...	...	4·9	4·2	15	2·46	...
44·3	·293	3·3	1·1	74·4	...	13·00	5·50	6·50	5·00	0·00	...	...	3·7	3·1	13	1·42	...
47·6	·333	3·7	1·2	74·6	...	10·50	4·00	8·50	8·00	0·00	...	...	3·6	2·5	19	2·21	...
57·0	·467	5·2	1·4	78·6	...	2·50	4·00	14·00	9·50	0·00	...	...	5·0	2·4	17	3·36	...
58·2	·485	5·3	2·6	65·9	...	5·00	8·50	10·50	7·00	0·00	...	...	2·6	4·3	16	3·98	...
54·2	·420	4·6	2·4	65·2	...	8·00	11·00	6·50	5·50	0·00	...	...	3·1	4·8	12	1·64	...
52·0	·388	4·3	1·8	71·5	...	4·00	1·00	11·50	13·50	0·00	...	...	4·0	4·9	11	1·96	...
45·8	·310	3·5	0·8	81·8	...	7·00	5·50	11·50	7·00	0·00	...	...	5·0	2·2	21	6·12	...
42·7	·275	3·2	0·7	88·1	...	6·50	2·00	13·00	8·50	0·00	...	...	6·5	4·3	22	4·00	...
39·8	·246	2·8	0·5	86·3	...	5·00	3·00	14·00	9·00	0·00	...	...	6·1	3·5	24	5·66	...
47·1	·332	3·7	1·2	78·5	...	80·50	64·50	135·50	83·50	0·00	...	...	4·8	3·6	216	41·44	...

Appendix

WOOLWICH. Lat. 51° 29′ N.

Month.	Readings of the Barometer. Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Temperature of the Air. Highest during Month.	Lowest during Month.	Range during Month.	Mean of all the highest.	Mean of all the lowest.	Mean Daily Range.	Mean Approximate Temperature.	Mean Daily Readings of Maximum in Sun's Rays.	Minimum on Grass.	Hygrometer. Dry Bulb.	Wet Bulb.
January	29·392	29·924	28·433	55·0	25·0	30·0	46·4	34·9	11·5	40·6	52·3	33·3	41·9	40·6
February	29·573	29·924	29·254	56·8	29·0	27·8	51·2	37·7	13·5	44·4	76·5	36·0	47·3	45·0
March	29·565	30·067	29·014	60·0	20·8	39·2	53·1	36·3	16·8	44·7	87·3	34·5	48·1	45·0
April	29·658	30·220	28·804	68·7	28·0	40·7	58·8	37·7	21·1	48·2	102·8	36·4	53·9	49·6
May	29·673	30·140	29·141	72·0	31·2	40·8	61·8	40·7	21·1	51·2	113·5	40·1	55·5	51·2
June	29·650	30·055	29·180	57·5	37·2	20·3	70·3	47·6	22·7	58·9	118·5	47·0	64·8	60·2
July	29·088	29·988	29·447	89·8	42·0	47·8	76·8	52·6	24·2	64·7	126·1	52·3	70·2	65·6
August	29·723	30·251	29·232	81·1	38·0	43·1	71·6	50·2	21·4	60·9	116·6	*	65·6	61·9
September	29·531	29·775	29·140	80·4	30·2	50·2	69·5	50·2	19·3	59·8	108·8	45·8	61·9	58·7
October	29·489	30·093	29·048	68·1	28·4	39·7	56·7	41·6	15·1	49·1	84·1	39·1	51·2	49·6
November	29·450	29·953	28·725	58·6	32·6	26·0	51·0	40·3	10·7	45·6	60·8	37·9	46·2	45·0
December	29·348	29·737	28·646	54·2	23·0	31·2	47·2	38·5	8·7	42·8	50·2	35·4	42·7	41·6
Yearly Sums, Means, Totals ...	29·512	30·011	29·005	66·8	30·4	36·4	59·5	42·4	17·1	50·9	91·5	39·8	54·1	51·2

EDINBURGH. Lat. 55° 57′ N.

January	28·900	29·473	27·816	53·5	27·0	26·5	43·5	34·4	9·1	38·9	45·5	32·9	40·7	38·4
February	29·201	29·723	28·693	52·0	33·0	19·0	45·5	36·3	9·2	40·9	59·8	34·7	43·1	40·3
March	29·254	29·739	28·730	58·5	23·0	35·5	47·0	35·6	11·4	41·3	69·5	34·9	43·5	40·3
April	29·378	29·891	28·880	62·0	30·0	32·0	51·8	37·4	14·4	44·6	80·7	36·6	48·0	43·7
May	29·355	29·839	28·450	63·0	32·0	31·0	54·1	40·2	13·9	47·1	84·8	39·7	50·5	46·4
June	†	†	†	‡	‡	‡	‡	‡	‡	‡	100·9	46·3	59·6	54·7
July	29·680	29·832	29·466								96·9	50·3	62·5	57·5
August	29·695	30·034	29·237								91·2	48·9	59·0	55·7
September	29·433	29·913	28·738	69·1	36·0	33·1	57·7	46·8	10·9	52·2	79·1	45·6	54·1	51·0
October	29·357	30·118	28·741	59·1	30·5	28·6	51·4	42·5	8·9	46·9	71·7	40·1	48·4	45·5
November	29·302	30·142	28·441	61·3	31·9	29·4	46·8	39·0	8·8	42·4	53·8	35·5	43·3	41·1
December	29·234	29·760	28·448	54·2	25·3	28·9	43·2	35·3	7·9	39·2	45·0	33·0	39·6	37·9
Yearly Sums, Means, and Totals ...	29·360	29·860	28·693	59·2	29·9	29·3	49·0	38·5	10·5	43·7	73·2	39·8	49·4	46·0

* Out of order. † Barometer out of order. ‡ Minimum in Air Thermometer not reliable.

No. XVI—*continued.*

Long. 0° 4′ E. Height above the Sea 145 feet.

Hygrometrical Results from Glaisher's Tables (3rd Edition).						Atmospherical Conditions.											
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.					Amount of Rain fall.	
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, Days.	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of days on which Rain fell.	On the Ground.	20 feet above the Ground.
											lb. per sq. foot	Miles				Inches	Inches
39·0	·239	2·8	0·3	90·5	542·8	1·00	6·75	13·75	9·50	0·00	...	217·8	5·9	5·6	17	2·85	2·64
42·5	·271	3·1	0·6	84·2	540·1	1·00	9·25	11·25	7·50	0·00	...	205·2	5·9	5·4	9	0·64	0·60
41·6	·262	3·0	0·8	78·4	540·2	5·00	9·25	7·00	9·75	0·00	...	180·0	5·8	4·9	9	1·88	1·62
45·4	·303	3·4	1·2	73·1	534·4	11·00	5·50	7·25	6·25	0·00	...	155·0	5·5	4·5	12	1·07	1·05
47·1	·326	3·7	1·3	73·7	532·9	9·00	5·00	6·50	10·50	0·00	...	133·3	3·8	4·9	13	2·55	2·43
56·4	·456	5·0	1·8	74·0	522·3	1·25	2·50	15·00	11·25	0·00	...	169·2	5·6	4·9	14	1·63	1·53
62·0	·559	6·1	2·0	75·2	516·9	4·25	4·25	12·50	10·00	0·00	...	110·2	5·3	4·8	14	2·22	2·07
58·8	·499	5·4	1·5	79·5	522·4	4·25	7·00	10·75	9·00	0·00	...	137·0	5·6	4·8	12	2·48	2·29
56·0	·449	4·9	1·2	81·7	523·0	0·50	1·75	16·25	11·50	0·00	...	209·8	5·9	5·4	11	0·13	0·11
48·0	·336	3·8	0·5	89·0	534·0	0·50	7·50	13·75	9·25	0·00	...	164·6	7·1	4·6	20	0·42	0·41
43·7	·285	3·3	0·4	91·6	538·9	5·75	1·75	15·50	7·00	0·00	...	252·0	7·3	4·6	22	0·26	0·24
40·3	·250	2·9	0·3	91·2	540·9	3·25	5·75	16·50	5·50	0·00	...	232·8	7·4	5·2	22	0·32	0·17
48·4	·353	3·9	0·9	81·8	533·5	46·75	66·25	146·00	107·00	0·00	...	180·5	6·9	4·9	175	16·45	15·16

Long. 3° 11′ W. Height above the Sea 402 feet.

																	*
35·5	·208	2·4	0·6	82·3	535·2	5·25	2·00	2·25	17·00	4·50	...	229·2	6·3	2·9	18	3·05	2·69
36·9	·220	2·4	0·7	79·1	538·2	1·00	6·75	5·00	13·25	3·00	...	236·3	6·0	1·7	12	2·15	1·73
36·5	·216	2·5	0·7	76·3	538·6	4·00	7·75	2·00	14·75	2·50	...	237·9	6·8	2·5	12	2·83	2·50
38·9	·237	2·7	1·1	71·2	537·1	5·50	5·50	3·25	13·75	2·00	...	275·9	6·1	3·9	7	1·69	1·39
42·1	·268	3·1	1·1	73·9	532·7	3·75	5·75	3·25	14·75	3·50	...	181·0	6·3	4·3	19	3·85	3·34
50·3	·366	4·1	1·6	71·5	...	0·75	2·75	7·00	14·50	5·00	...	147·4	6·2	2·3	17	2·99	2·74
53·2	·407	4·5	1·8	72·0	525·3	1·50	9·50	1·75	11·25	7·00	...	178·1	5·6	1·1	13	4·14	3·96
52·7	·399	4·5	1·1	80·2	529·2	1·50	12·00	6·25	7·25	4·00	...	152·4	6·7	0·5	16	3·27	3·00
48·0	·333	3·8	0·9	79·4	530·1	5·00	5·50	1·00	17·00	1·50	...	199·4	7·7	2·1	21	5·31	4·60
42·3	·271	3·1	0·8	80·1	536·0	4·00	3·75	5·00	13·75	4·50	...	205·5	6·2	1·4	15	3·84	3·41
38·5	·233	2·7	0·5	82·7	539·6	4·00	5·00	9·75	10·75	0·50	...	275·2	6·8	1·8	21	3·52	3·26
35·7	·210	2·4	0·4	86·4	542·5	1·75	6·75	7·00	12·00	3·50	...	253·4	7·2	3·9	18	1·84	1·23
42·5	·281	3·2	9·4	78·0	535·0	38·00	73·00	53·50	160·00	41·50	...	214·3	6·5	2·4	189	38·48	33·85

* 120 feet above the ground.

Appendix

Abstract of Results of Meteorological Observations

Stations, with their Height above the Sea.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
							Mean.						Hygrometer.	
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Year.	Lowest during Year.	Range during Year.	Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.	Maximum in Sun's rays.	Minimum on Grass.	Dry Bulb.	Wet Bulb.
Aldershot ... 325 ft.	29·446	30·081	28·230	88·4	24·8	63·6	59·6	43·3	16·3	51·5	93·6	40·4	53·3	49·7
Canterbury 80 „	...	...	...	94·2	9·0	85·2	61·0	38·9	22·1	49·9	...	...	55·5	51·3
Chatham ... 160 „	29·647	30·319	28·557	93·4	22·3	71·1	61·3	40·4	20·9	50·8	98·7	39·0	54·1	52·3
Colchester* 109 „	29·676	30·319	28·448	90·1	22·5	67·6	60·3	39·7	20·6	50·0	90·9	37·8	54·6	50·6
Devonport† 35 „	29·575	30·281	28·457	82·4	21·5	60·9	60·9	40·8	20·1	50·9	95·5	36·5	55·1	51·4
Dover ... 325 „	...	...	...	86·0	23·5	62·5	57·3	40·7	16·6	49·0	...	...	53·4	50·4
Guernsey‡ ... 248 „	29·455	30·219	28·163	83·6	...	...	59·1	...	...	...	103·4	41·1	53·9	51·5
Jersey ... 72·5 „	29·612	30·130	28·630	92·4	20·0	72·4	62·6	41·9	20·7	52·2	...	...	55·2	52·3
Netley .... 47 „	29·774	30·436	28·676	84·2	11·0	73·2	60·2	42·5	17·7	51·3	99·0	40·6	54·2	50·7
Parkhurst § 200 „	...	...	...	84·5	21·0	63·5	61·1	42·8	18·3	51·9	91·9	39·8	55·5	51·3
Portsmouth 20 „	29·826	30·541	28·753	81·6	24·8	56·8	59·2	42·3	16·9	50·7	92·9	37·2	54·5	50·1
Preston ‖ ... 220 „	...	...	...	85·0	18·8	66·2	56·9	37·6	19·3	47·2	...	...	51·8	48·8
Sheerness 2 ft. below	...	...	...	86·0	24·0	62·0	59·5	43·5	16·0	51·5	...	...	53·5	50·5
Shorncliffe ... 220 ft.	29·678	30·596	28·586	88·5	24·2	64·3	58·5	43·8	14·7	51·2	93·4	40·0	53·1	50·4
Winchester,.. 214 „	...	...	...	86·0	21·0	65·0	60·5	38·8	21·7	49·6	...	...	53·9	50·4
Woolwich ... 145 „	29·512	30·220	28·433	89·8	20·8	69·0	59·5	42·4	17·1	50·9	91·5	39·8	54·1	51·2
Edinburgh ¶ 402 „	29·360	30·142	27·816	**	**	**	**	**	**	**	73·2	39·8	49·4	46·0

Abstract of Results of Meteorological Observations

Athlone. Lat. 53° 26′ N.

January	...	...	...	54·0	22·0	32·0	47·7	29·5	18·2	38·6	...	...	39·7	38·1
February	...	...	...	59·5	28·5	31·0	53·6	33·1	20·5	43·3	...	...	44·9	42·7
March	...	...	...	66·0	27·0	39·0	56·5	33·8	22·7	45·1	...	...	48·5	46·2
April	...	...	...	70·9	30·0	40·9	60·2	35·4	24·8	47·3	...	...	51·5	49·5
May	...	...	...	72·2	21·9	50·3	62·7	34·1	28·6	48·4	...	...	53·7	50·5
June	...	...	...	80·0	32·0	48·0	67·8	43·4	24·4	55·6	...	...	58·7	55·3
July††	...	...	...	80·9	41·0	39·9	73·6	49·4	24·2	61·5	...	...	65·2	59·9
August	...	...	...	79·0	38·0	41·0	70·3	48·3	22·0	59·3	...	...	63·6	58·7
September	...	...	...	70·8	32·0	38·8	64·2	45·1	19·1	54·6	...	...	57·3	54·2
October	...	...	...	62·5	25·6	36·9	54·8	36·0	18·8	45·4	...	...	48·5	46·3
November	...	...	...	64·5	26·0	38·2	48·7	33·9	14·8	41·3	...	...	44·5	42·6
December	...	...	...	53·8	24·0	29·8	44·8	32·7	12·1	38·7	...	...	40·9	39·8
Yearly Sums, Means, and Totals ...	...	...	...	67·8	29·0	38·8	58·7	37·9	20·8	48·3	...	...	51·4	48·6

Belfast. Lat. 54° 36′ N.

January	29·331	29·898	28·482	††	††	††	††	††	††	††	††	...	41·8	39·6
February	29·561	30·135	29·151	61·0	26·5	34·5	51·4	36·4	15·0	43·9	65·2	...	45·5	42·6
March	29·641	30·158	29·035	60·2	28·0	32·2	52·5	36·4	16·1	44·4	77·5	34·6	47·1	43·0
April	29·828	30·320	29·129	66·4	30·6	35·8	57·4	38·5	18·9	47·9	95·4	37·1	50·4	46·3
May	29·773	30·431	29·015	67·9	31·4	36·5	60·4	41·6	18·8	51·0	102·4	39·8	53·3	49·0
June	29·729	30·159	29·166	78·1	37·2	40·9	67·1	48·1	19·0	57·6	105·2	46·2	59·9	55·0
July	29·850	30·088	29·609	80·1	43·5	36·6	73·2	51·2	22·0	62·2	116·1	48·3	65·5	59·3
August	29·871	30·214	29·320	76·2	40·5	35·7	69·7	49·8	19·9	59·7	106·6	§§	62·6	57·8
September	29·679	30·129	29·157	75·7	35·2	40·5	63·8	47·9	15·9	55·8	95·4	46·5	57·3	53·6
October	29·571	30·278	28·918	62·6	32·4	30·2	55·6	40·3	15·3	47·9	78·1	38·3	49·2	40·3
November	29·487	30·292	28·422	65·4	29·1	36·3	50·9	36·9	14·0	43·9	66·0	35·8	45·1	43·0
December	29·384	29·952	28·588	57·7	25·7	32·0	46·6	34·7	11·9	40·6	52·8	33·8	42·0	40·7
Yearly Sums, Means, and Totals ...	29·642	30·171	28·999	68·3	32·8	35·5	59·0	42·0	17·0	50·5	87·3	...	51·6	47·5

* Colchester.—May observations extend over only 26 days.
† Devonport.—September „ „ „ 29 „
‡ Guernsey.—Minimum in air thermometer out of order for August, September, October, and November.
§ Parkhurst.—January return useless. Rain guage for 8 months only.

No. XVI—*continued.*

taken at Stations in England and Scotland in the year 1872.

Hygrometrical Results from Glaisher's Tables (3rd edition)						Atmospherical Conditions.												
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	In a Cubic Foot of Air.		Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	Number of Days for mean Direction of Wind.				Number of calm, or nearly calm, Days.	Calculated from Robinson's Anemometer.		Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	Rain fall on the Ground.	Latitude.	Longitude.
		Mean Weight of Vapour.	Mean additional Weight required for Saturation.			North.	East.	South.	West.		Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.						
											lbs. per sq. foot	Miles				Inches	° ′	° ′
46·2	·324	3·7	1·2	77·5	531·2	56·50	51·00	126·00	132·50	0·00	...	236·0	7·5	2·2	212	37·81	51 15 N.	0 45 W
48·0	·343	3·8	1·3	78·0	...	63·50	34·75	137·25	125·50	5·00	...	...	5·8	4·9	210	35·45	51 17 ,,	1 5 E.
50·6	·385	4·3	0·6	88·5	534·6	47·00	38·75	171·75	93·50	15·00	...	202·1	5·6	3·6	203	32·09	51 23 ,,	0 32 ,,
45·9	·330	3·7	1·3	77·4	533·9	49·25	59·25	126·25	126·25	0·00	...	265·5	7·4	3·2	196	29·77	51 53 ,,	0 54 ,,
47·7	·340	3·8	1·2	77·3	532·6	61·50	57·00	120·00	125·00	1·50	...	220·3	6·4	4·8	235	55·89	50 17 ,,	4 5 W.
46·8	·330	3·7	1·1	76·5	...	46·00	61·50	118 00	138·00	2·50	...	...	5·2	4·4	196	40·12	51 8 ,,	1 19E.
48·9	·356	3·0	0·8	83·8	531·1	63·50	51·50	115·75	135·25	0·00	...	370·4	5·7	6·2	234	50·43	49 33 ,,	2 40 W.
49·6	·365	4·1	9·8	74·4	531·3	63·25	53·75	149·00	85·00	15·00	...	...	4·8	6·1	160	39·22	49 11 ,,	2 6 ,,
47·2	·333	3·7	1·2	77·1	536·0	64·50	35·00	119·25	147·25	0·00	...	246·4	6·7	4·5	200	38·65	50 51 ,,	1 20 ,,
47·5	·338	3·8	1·2	75·2	...	48·75	58·00	76·00	129·75	22·50	...	...	6·5	6·4	143	39·41	50 45 ,,	1 16 ,,
46·0	·317	3·5	1·4	73·7	537·0	51·50	49·25	140·50	124·75	0·00	...	165·5	6·9	2·5	206	36·66	50 45 ,,	1 5 ,,
45·8	·319	3·6	0·9	80·8	...	72·00	66·50	36·50	179·50	11·50	...	...	6·4	3·0	203	49·47	53 45 ,,	2 40 ,,
47·7	·341	3·9	1·0	81·4	...	65·75	35·50	112·50	152·25	0·00	...		6·4	5·4	199	27·62	51 23 ,,	0 49 E.
47·8	·340	3·8	0·9	82·8	535·3	56·75	55·50	100·25	148·50	5·00	...	317·8	4·9	4·7	186	41·33	51 5 ,,	1 10 ,,
47·1	·332	3·7	1·2	78·5	...	80·50	64·50	135·50	83·50	0·00	...	...	4·8	3·6	216	41·44	51 4 ,,	1 20 W.
48·4	·353	3·9	0·9	81·8	533·5	46·75	66·25	146·00	107·00	0·00	...	180·5	6·9	4·9	175	16·45	51 29 ,,	0 4 E.
42·5	·281	3·2	0·9	78·0	535·0	38·00	73·00	53·50	160·00	41·50	...	214·3	6·5	2·4	189	38·48	55 57 ,,	3 11 W.

taken at Stations in Ireland in the year 1872.

Long. 8° 0′ W. Height above Sea 304 feet.

36·0	·212	2·5	0·4	87·2	...	3·75	1·25	12·50	13·50	0·00	...	...	8·3	6·3	19	2·92	...	...
40·1	·249	2·8	0·5	84·2	...	2·75	2·75	11·75	11 75	0·00	...	...	5·9	6·0	22	2·85	...	...
43·7	·285	3·2	0·6	83·9	...	1·50	2·75	13·75	13·00	0·00	...	...	5·2	5·4	11	0·92	...	...
47·5	·329	3·7	0·6	86·5	...	3·00	2·75	12·00	12·25	0·00	...	...	3·4	5·5	9	1·67	...	...
47·4	·326	3·7	0·9	78·8	...	7·75	5·25	8·75	9·25	0·00	...	...	4·2	6·1	12	1·17	...	...
52·2	·392	4·3	1·2	79·3	...	2·00	1·00	13·75	13·25	0·00	...	...	6·3	6·3	18	2·78	...	...
55·6	·442	4·8	2·0	71·7	...	4·00	6·75	8·50	9·75	0·00	...	...	3·4	4·6	5	1·50	...	...
54·6	·428	4·7	1·8	73·1	...	4·50	9·00	4·25	12·25	1·00	...	...	6·3	3·2	17	5·08	...	...
51·4	·379	4·2	1·0	80·7	...	3·25	4 25	5·50	17·00	0·00	...	...	6·8	4·0	25	4·16	...	...
43·9	·288	3·3	0·6	84·6	...	5·75	5·75	5·25	14·25	0·00	...	...	5·2	3·2	18	5·20	...	...
40·4	·251	2·9	0·5	85·8	...	6·75	4·50	7·25	11·50	0·00	...	...	5·4	3·8	24	4·53	...	...
38·5	·233	2·7	0·2	91·2	...	6·50	5·75	11·75	7·00	0·00	...	...	7·1	3·5	20	5·92	...	...
45·8	·318	13·6	0·8	82·2	...	51·50	51·75	115·00	144·75	1·00	...	...	5·6	4·8	200	38·70	...	...

Long. 5° 57′ W. Height above Sea 50 feet.

36·9	·221	2·5	0·5	84·0	542·0	3·00	5·00	11·50	8·50	3·00	...	73·0	3·6	0·5	25	4·77	...	...
39·3	241	2·8	0·7	79·2	542·0	0·50	6·50	15·00	5·00	2·00	...	82·3	3·7	0·9	22	3·95	...	...
38·4	·232	2·7	1·0	72·5	541·7	6·00	5·00	14·00	5·00	1·00	...	73·4	4·0	1·8	18	2·29	...	...
42·0	·267	3·0	1·1	73·8	541·5	7 00	5·00	10·50	6·50	1·00	...	86·6	5·1	2·9	12	3·14	...	...
44·7	·296	3·4	1·2	72·5	536·1	8·00	1·50	12·00	8·50	1·00	...	62·6	4·4	2·9	20	2·45	...	...
50·7	·370	4·1	1·7	71·5	529·2	2·50	6·00	17·00	4·50	0·00	...	74·4	4·8	1·7	23	4·09	...	...
54·2	·421	4·6	2·4	67·5	525·3	7·50	8·00	9·50	5·00	1·00	...	61·4	4·7	1·2	12	3·82	...	...
53·7	·414	4·6	1·7	73·0	528·6	7·00	8·00	11·00	5·00	0·00	...	52·5	4·8	1·6	17	3·81	...	...
50·2	·364	4·0	1·2	77·1	530 9	8·00	4·00	8·00	9·00	1·00	...	82·3	5·4	2·3	25	4·94	...	...
43·2	·280	3·2	0·8	79·9	538·0	8·00	7·00	9·50	5·50	1·00	...	62·8	4·9	0·7	21	5·39	...	...
40·6	·252	2·9	0·5	84·4	541·0	5·00	5·50	10·50	8·00	1·00	...	82·7	4·7	0·9	25	4·29	...	...
39·1	·239	2·7	0·4	89·9	542·5	7·50	6·50	11·50	4·50	1·00	...	73·5	4·4	1·2	27	6·13	...	...
44·4	·300	3·4	1·1	75·5	536·6	70·00	68·00	140·00	75·00	18·00	...	72·3	4·5	1·5	247	49·07	...	...

‖ Preston.—Maximum in air thermometer broken in November.
¶ Edinburgh.—Barometer for 10 months only. ** Summary useless.
†† July—Observations extend over 29 days only. ‡‡ 11 months only §§ Out of order.

Appendix

BUTTEVANT. Lat. 52° 14′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
							Mean						Hygrometer.	
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.	Maximum in Sun's rays.	Minimum on Grass.	Dry Bulb.	Wet Bulb.
January	...	...	...	55·0	25·0	30·0	47·5	30·6	16·9	39·0	...	...	41·8	40·4
February	...	...	...	57·0	30·0	27·0	51·9	36·4	15·5	44·1	...	...	47·9	44·9
March	...	...	...	65·0	22·0	43·0	58·0	35·4	22·6	46·7	...	...	48·3	45·7
April	...	...	...	66·0	23·0	43·0	63·2	33·7	29·5	48·4	...	...	53·3	55·7
May	...	...	...	65·0	27·0	38·0	62·0	35·0	27·0	48·5	...	...	57·9	55·6
June	...	...	...	72·0	38·0	34·0	66·1	45·2	20·9	55·6	...	...	61·6	59·5
July	...	...	...	76·0	44·0	32·0	74·4	49·1	25·3	61·7	...	...	65·0	63·0
August	...	...	...	76·0	43·0	33·0	74·4	48·2	26·2	61·3	...	...	66·6	64·7
September	...	...	...	76·0	26·0	50·0	68·7	42·2	26·5	55·4	...	...	60·4	58·9
October... ...	...	...	...	61·0	25·0	36·0	57·1	30·7	26·4	43·9	...	...	51·3	49·5
November	...	...	...	58·0	22·0	36·0	51·9	31·2	20·7	41·5	...	...	44·8	43·2
December	...	...	...	52·0	28·0	24·0	48·1	32·6	15·5	40·3	...	...	44·0	43·1
Yearly Sums, Means, and Totals ...	...	...	...	64·9	29·4	35·5	60·3	37·5	22·8	48·9	...	...	54·0	52·0

CORK. Lat. 51° 53′ N.

January	29·221	29·275	28·250	54·0	26·0	28·0	48·8	32·8	16·0	40·8	59·5	27·0	43·0	40·3
February	29·348	29·887	28·914	55·0	29·0	26·0	51·7	35·6	16·1	43·6	63·6	32·9	46·8	44·4
March	29·444	29·892	28·794	60·0	28·0	32·0	53·5	37·0	16·5	45·2	70·4	34·9	48·1	45·1
April	29·668	30·076	28·645	66·0	33·0	33·0	57·5	39·4	18·1	48·4	73·1	37·6	51·0	47·2
May	29·688	30·176	29·109	70·0	34·0	36·0	60·1	40·7	19·4	50·4	72·1	38·4	52·9	50·3
June	29·596	29·963	29·003	68·0	37·0	31·0	62·9	46·6	16·3	54·7	86·6	44·9	56·7	53·5
July	29·626	29·960	29·299	77·0	46·0	31·0	70·3	51·3	19·0	60·8	95·3	49·5	64·3	61·1
August	29·696	30·057	29·085	74·0	44·0	30·0	68·2	49·1	19·1	58·6	92·4	47·6	63·1	59·4
September	29·581	30·049	29·005	70·0	34·4	35·6	63·8	46·8	17·0	55·3	89·5	45·5	59·3	55·8
October	29·431	30·079	28·487	62·3	30·1	32·2	55·7	36·7	19·0	46·2	78·3	35·3	50·4	47·9
November	29·369	30·090	27·997	59·7	27·2	32·5	51·8	36·7	15·1	44·2	69·5	34·8	46·8	44·6
December	29·181	29·649	28·447	56·6	28·5	28·1	49·5	36·0	13·5	42·7	61·6	34·6	45·2	42·4
Yearly Sums, Means, and Totals ...	29·484	29·929	28·086	64·4	33·1	31·3	57·8	40·7	17·1	49·2	76·4	38·6	52·3	49·3

CURRAGH CAMP. Lat. 52° 8′ N.

January	28·999	29·466	28·394	55·4	23·6	31·8	47·1	33·8	13·3	40·5	58·9	29·4	40·7	38·5
February	29·128	29·517	28·750	58·6	28·7	29·9	52·4	37·4	15·0	44·9	67·3	32·8	44·8	42·5
March	29·225	29·635	28·494	61·6	24·4	37·2	53·7	37·8	15·9	45·7	70·1	33·1	46·0	43·1
April	29·405	29·904	28·504	65·6	26·6	39·0	57·6	37·7	19·9	47·6	80·0	33·3	49·8	45·9
May	29·430	29·899	28·813	69·4	27·4	42·0	60·5	40·2	20·3	50·3	90·4	36·9	52·7	48·6
June	29·425	29·784	28·748	77·4	34·3	43·1	66·1	46·6	19·5	56·3	102·0	43·1	58·6	54·2
July	29·420	29·712	29·163	82·8	42·6	40·2	73·2	50·5	22·7	61·8	108·4	46·4	64·8	59·2
August	29·476	29·809	28·907	78·8	40·5	38·3	70·0	49·3	20·7	59·6	104·0	45·1	62·5	57·4
September	29·322	29·801	28·871	75·6	30·5	44·5	63·3	45·2	18·1	54·2	87·9	41·3	56·4	53·1
October	29·187	29·848	28·472	61·6	25·3	36·3	54·1	36·9	17·2	45·5	72 6	33·6	47·5	44·3
November	29·079	29·830	27·999	66·5	25·9	40·6	49·9	34·0	15·9	41·9	56·1	31·3	43·0	40·2
December	28·984	29·541	28·288	54·4	22·4	32·0	45·4	32·0	13·4	38·7	50·8	29·1	40·6	38·1
Yearly Sums, Means, and Totals ...	29·248	29·725	28·617	67·3	29·4	37·9	57·8	40·1	17·7	48·9	79·1	36·3	50·6	47·1

No. XVI—*continued.*

Long. 8° 40′ W. Height above Sea 300 feet.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.										
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.				Amount of Rain fall.	
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, Days.	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	On the Ground.	Feet above the Ground.
											lbs. per sq. foot.	Miles.				Inches	Inches.
38·7	·236	2·7	0·3	89·6	...	1·25	4·75	17·50	7·50	0·00	...	...	6·7	7·1	26	5·00	...
41·7	·264	3·1	0·7	79·9	...	4·50	16·25	6·50	1·75	0·00	...	...	4·9	7·4	23	4·95	...
42·9	·276	3·2	0·7	82·1	...	4·00	9·25	12·00	5·75	0·00	...	...	6·5	7·1	23	2·50	...
53·4	·409	4·5	0·9	83·7	...	3·25	14·75	8·25	3·75	0·00	...	...	5·8	7·5	13	1·59	...
53·5	·412	4·5	0·8	85·2	...	2·75	19·50	6·75	2·00	0·00	...	...	5·5	7·7	16	3·35	...
57·7	·478	5·3	0·8	87·4	...	1·75	13·00	9·50	5·75	0·00	...	...	5·9	8·1	24	4·82	...
61·4	·544	6·0	0·8	88·0	...	1·25	7·50	12·75	9·50	0·00	...	...	5·4	8·2	24	4·65	...
63·2	·580	6·4	0·8	89·2	...	4·50	6·00	13·75	6·75	0·00	...	...	4·7	8·0	22	3·27	...
57·6	·476	5·3	0·6	91·0	...	3·00	6·00	12·00	9·00	0·00	...	...	5·3	8·2	21	2·99	...
47·7	·332	3·7	0·5	87·7	...	2·50	10·25	12·50	5·75	0·00	...	...	4·7	8·3	26	3·20	...
41·4	·260	3·0	0·4	88·0	...	5·25	8·75	11·00	5·00	0·00	...	...	4·8	7·9	22	5·27	...
42·0	·267	3·0	0·3	92·8	...	1·75	11·50	10·75	7·00	0·00	...	...	5·4	8·4	29	8·40	...
50·1	·376	4·2	0·6	87·0	...	35·75	127·50	133·25	69·50	0·00	...	...	5·5	7·6	269	49·99	...

Long. 8° 20′ W. Height above Sea 257 feet.

37·1	·221	2·6	0·6	79·8	538·6	3·75	0·50	9·50	17·25	0·00	...	152·7	8·8	5·0	26	7·76	6·79
41·7	·264	3·0	0·7	83·2	536·5	1·00	3·50	16·00	8·50	0·00	...	159·9	8·0	4·9	19	6·48	5·74
41·8	·264	3·0	0·8	79·1	537·8	4·25	5·50	11·75	9·50	0·00	...	158·1	8·0	5·1	15	4·31	3·71
43·2	·281	3·2	1·0	75·2	537·9	7·75	2·00	5·00	15·25	0·00	...	157·1	7·6	5·0	10	1·84	1·51
47·7	·332	3·7	0·8	82·7	536·0	15·25	3·75	2·25	9·75	0·00	...	160·2	7·0	5·0	11	2·56	2·23
50·5	·368	4·1	1·0	80·8	530·0	6·00	0·00	9·00	15·00	0·00	...	166·2	7·2	4·6	19	2·53	4·66
53·4	·491	5·4	1·3	81·1	522·2	9·25	1·75	11·75	8·25	0·00	...	152·4	6·9	5·1	12	7·40	6·91
56·3	·454	5·0	1·4	78·6	524·7	9·25	5·50	7·25	9·00	0·00	...	144·3	7·0	5·0	13	5·68	5·11
52·7	·398	4·5	1·2	79·3	526·9	9·00	3·00	3·25	14·75	0·00	...	144·8	7·2	4·5	13	4·54	3·98
45·3	·303	3·4	0·7	83·0	534·0	13·00	4·00	4·25	9·75	0·00	...	147·3	7·2	4·7	13	4·57	4·19
42·1	·269	3·1	0·6	84·6	536·6	8·25	2·00	6·50	13·25	0·00	...	*	8·0	4·4	20	11·31	10·17
39·2	·239	2·8	0·7	79·6	535·4	5·50	2·25	8·25	15·00	0·00	...	169·6	8·9	4·4	20	11·11	10·41
46·3	·322	3·6	0·9	80·6	533·0	92·25	33·75	94·75	145·25	0·00	...	155·7	7·6	4·6	191	72·84	65·41

Long. 6° 48′ W. Height above Sea 450 feet.

35·7	·209	2·4	0·5	83·1	537·0	4·25	0·25	13·25	13·25	0·00	...	585·5	8·8	3·8	22	4·03	† 3·62
39·8	·246	2·8	0·6	83·2	534·8	0·75	2·25	16·25	9·75	0·00	...	376·0	7·0	4·5	25	3·16	2·81
39·8	·246	2·8	0·8	79·7	535·4	6·50	2·75	12·00	9·75	0·00	...	351·1	8·4	4·4	16	3·20	3·01
41·8	·266	3·0	1·1	74·4	534·4	6·75	2·75	8·75	11·75	0·00	...	328·7	6·6	4·4	12	2·94	2·70
44·5	·294	3·3	1·2	74·1	531·6	8·50	4·25	5·00	13·25	0·00	...	252·6	6·2	4·4	19	1·88	1·66
50·2	·364	4·1	1·4	74·0	523·3	4·00	0·25	10·25	15·00	0·00	...	294·6	6·6	3·5	20	3·78	3·43
54·4	·427	4·7	2·1	69·8	518·4	5·50	6·00	10·75	8·75	0·00	...	267·7	4·4	3·2	11	1·26	1·10
53·1	·404	4·5	1·8	71·5	521·7	8·50	3·25	8·75	10·50	0·00	...	250·3	4·8	2·8	17	3·49	3·21
50·0	·362	4·0	1·0	79·2	525·5	7·00	1·00	8·50	13·50	0·00	...	297·7	6·5	3·2	19	3·16	2·84
50·8	·251	2·9	0·8	78·1	533·9	9·00	3·00	8·75	10·25	0·00	...	292·5	6·5	2·8	22	5·32	4·86
36·8	·219	2·5	0·7	79·2	535·9	6·00	2·75	10·25	11·00	0·00	...	355·3	7·8	3·1	23	3·40	‡
34·9	·203	2·4	0·6	80·6	536·9	4·25	3·75	13·75	8·25	1·00	...	287·3	8·9	2·8	20	5·81	4·60
43·5	·291	3·4	1·0	77·2	531·6	71·00	32·25	126·25	135·50	1·00	...	311·6	6·8	3·6	226	41·43	33·84

* Out of order. † 20 ft. above the ground. ‡ Broken.

Appendix

DUBLIN. Lat. 53° 25′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Mean				Maximum in Sun's rays.	Minimum on Grass.	Hygrometer.	
							Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.			Dry Bulb.	Wet Bulb.
January	29·300	29·856	28·394	58·0	20·0	38·0	48·5	32·9	15·6	40·7	70·3	25·1	42·8	41·2
February	29·495	30·066	29·074	59·3	27·8	31·5	52·1	37·6	14·5	44·8	78·9	31·4	46·9	45·2
March	29·575	30·066	28·903	62·2	25·2	37·0	53·4	37·3	16·1	45·3	92·0	31·6	48·0	46·2
April	29·779	30·260	28·989	68·2	27·2	41·0	57·9	37·5	20·4	47·7	112·6	32·8	51·7	48·4
May	29·774	30·217	29·126	75·0	28·2	46·8	60·7	40·2	20·5	50·4	114·2	36·7	53·2	49·9
June	29·681	30·080	29·041	80·9	35·0	45·9	67·2	46·2	21·0	56·7	120·4	43·5	59·2	56·0
July	29·748	30·018	28·967	86·0	41·0	45·0	73·2	50·9	22·3	62·0	125·9	47·2	65·7	62·2
August	29·280	30·119	29·200	75·4	30·5	44·9	69·9	50·0	19·9	59·9	118·7	46·1	63·4	60·3
September	29·638	30·090	29·253	77·2	32·0	45·2	65·3	46·9	18·4	56·1	108·5	42·0	59·2	56·8
October	29·508	30·157	28·847	64·0	28·6	35·4	55·3	38·3	17·3	46·9	93·1	33·1	50·2	48·3
November	29·439	30·166	28·405	64·8	27·8	37·0	51·6	35·8	15·8	43·7	77·5	35·5	45·7	43·5
December	29·307	29·850	27·989	60·2	23·4	36·8	47·5	38·9	13·6	40·7	60·3	31·8	42·6	41·2
Yearly Sums, Means, and Totals ...	29·544	30·079	28·849	69·3	28·9	40·4	58·6	40·6	18·0	49·6	97·7	36·4	52·4	49·1

FERMOY. Lat. 52° 2′ N.

January	...	...	...	...	...	...	...	...	...	...	...	...	43·3	41·8
February	...	...	...	55·5	26·0	29·5	51·7	35·6	16·1	43·6	...	...	46·9	45·3
March	...	...	...	61·5	19·0	42·5	53·1	38·4	14·7	45·7	...	...	48·5	47·1
April	...	...	...	66·0	22·5	43·5	57·3	35·4	21·9	46·3	...	...	51·4	49·7
May	...	...	...	70·0	27·0	43·5	60·6	36·7	23·9	48·6	...	...	54·1	50·8
June	...	...	...	70·0	36·0	34·0	64·4	48·6	15·8	56·5	...	...	59·6	53·9
July	...	...	...	...	...	...	...	...	...	...	...	...	...	...
August	...	...	...	...	...	...	...	...	...	...	...	...	...	...
September	...	...	...	77·5	33·5	44·0	65·9	49·1	16·8	57·5	...	...	59·1	56·0
October...	...	...	...	68·0	28·8	39·2	56·4	39·2	17 2	47 8	...	...	50·1	47·8
November	...	...	...	62·1	24·8	37·3	51·1	37·6	13·5	44·3	...	...	45·6	44·1
December	...	...	...	55·5	28·0	27·5	48·7	36·1	12·6	42·4	...	...	44·4	43·7
Yearly Sums, Means, and Totals ...	...	...	...	65·1	27·4	37·7	56·5	39·6	16·9	48·1	...	...	50·3	48·2

For 9 months only.

LIMERICK. Lat. 52° 40′ N.

January	...	...	...	56·5	21·9	34·6	52·9	30·3	22·6	41·6	...	...	43·2	41·5
February	...	...	...								...	...	47·3	44·8
March	...	...	...	*	*	*	*	*	*	*	...	...	49·4	46·2
April	...	...	...								...	...	52·8	47·9
May	...	...	...								...	...	55·2	50·6
June	...	...	...	73·0	36·5	36·5	64·2	44·6	19·6	54·4	...	...	60·0	57·2
July	...	...	...	75·0	40·0	35·0	70·4	48·8	21·6	59·6	...	...	66·0	62·1
August...	...	...	...	78·0	36·0	42·0	69·0	47·7	21·3	58·3	...	...	65·1	60·5
September†	...	...	...	...	...	...	...	...	...	...	...	...	...	...
October†	...	...	...	...	...	...	...	...	...	...	...	...	...	...
November†	...	...	...	...	...	...	...	...	...	...	...	...	...	...
December‡	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Yearly Sums, Means and Totals§...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

* Maximum in Air Thermometer broken.
† Instruments removing.
‡ Return perfectly useless.
§ Summary useless.

No. XVI—*continued.*

Long. 6° 20′ W. Height above Sea 72 feet.

Hygrometrical Results from Glaisher's Tables (edition).						Atmospherical Conditions.											
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.					Amount of Rain fall.	
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, Days.	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	On the Ground.	25 Feet above the Ground.
											lbs. per sq. foot	Miles				Inches	Inches
39·3	·241	2·8	0·4	87·2	540·0	0·50	5·50	16·00	9·00	0·00	...	159·2	6·3	5·0	23	2·88	...
43·3	·281	3·2	0·5	88·1	539·0	0·50	7·50	13·00	8·00	0·00	...	128·4	6·4	4·1	19	2·40	...
44·2	·290	3·3	0·5	87·4	539·3	3·75	6·75	10 25	10·25	0·00	...	117·8	6·8	4·9	20	2·85	...
45·1	·301	3·4	0·9	78·2	539·0	4·00	5·25	5·00	15·75	0·00	...	132·6	6·8	7·2	13	1·60	...
46·6	·317	3·6	1·0	78·4	537·4	4·75	3·00	4·00	19·25	0·00	...	81·9	7·1	8·4	22	1·82	...
53·1	·405	4·6	1·1	81·0	528·7	0·00	6·75	9·75	13·00	0·00	...	85·9	7·1	5·8	20	3·68	...
50·3	·507	5·5	1·4	80·5	522·7	2·00	8·00	10·25	10·75	0·00	...	60·4	6·3	4·5	14	1·00	...
57·7	·478	5·3	1·2	81·2	526·0	0·75	9·75	9·50	11·00	0·00	...	71·3	6·3	3·6	17	3·39	...
54·7	·428	4·8	0·8	85·8	527·8	3·25	4·25	4·75	17·75	0·00	...	90·5	6·2	4·1	9	1·51	...
46·3	·314	3·6	0·5	86 9	535·5	4·50	4·75	6·75	15·00	0·00	...	98·8	6·1	3·2	21	3·68	...
41·0	·258	2 9	0·6	84·3	539 5	4·25	2·75	11·50	9·00	2·50	...	132·7	7·1	3·9	24	3·38	...
39·5	·243	2·8	0·4	88·8	540·3	1·75	8·00	9·50	11·25	0·50	...	52·3	8·1	3·5	23	4·78	...
47·5	·339	3·8	0·8	84·0	534·6	30·00	72·25	110·25	150·00	3·00	...	101·0	6·7	4·8	225	32·97	...

Long. 8° 18′ W. Height above Sea 176 feet.

39·8	·246	2·8	0·4	86·9	...	5·25	4·00	12·00	9·75	0·00	...	...	5·5	3·0	29	5·62	...
43·5	·283	3·2	0·5	88·8	...	5·75	6·75	11·00	5·50	0·00	...	...	4·9	3·5	27	5·18	...
45·6	·306	3·4	0·4	90·2	...	5·55	8·25	9·25	6·25	0·00	...	...	4·6	3·4	22	3·60	...
48·0	·336	3·7	0·5	88·1	...	7·25	7·75	8·25	6·75	0·00	...	...	4·2	3·8	15	1·47	...
47·6	·328	3·7	1·0	78·3	...	10·00	5·50	4·50	11·00	0·00	...	...	5·2	...	17	1·31	...
52·6	·398	4·4	1·3	78·4	...	6·50	0·50	13·75	9·25	0·00	...	...	6·0	...	19	2·90	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
53·2	·406	4·6	1·0	81·5	...	4·00	2·00	7·00	17·00	0·00	...	...	5·5	6·1	23	1·31	...
45·4	·303	3·4	0·7	84·2	...	5·75	3·00	7·25	15·00	0·00	...	...	5·9	5·9	22	3·43	...
42·4	·273	3·1	0·4	88·6	...	8·00	3·00	9·25	9·75	0·00	...	...	6·5	5·4	23	4·84	...
42·9	·276	3·2	0·2	94·8	...	6·75	5·00	10·75	8·50	0·00	...	...	7·8	5·6	24	8·20	...
46·1	·315	3·5	0·6	85·9	...	66·50	45·75	93·00	98·75	0·00	...	...	4·7	4·6	221	37·86	...
						For 10 months only.									8 m. 10 months.		

Long. 8° 36′ W. Height above Sea 75 feet.

39·5	·242	2·8	0·4	...	...	2·00	3·50	21·50	3·00	1·00	...	...	7·4	3·8	28	5·19	...
42·1	·268	3·1	0·6	...	...	1·50	12·50	14·00	1·00	0·00	...	...	6·3	4·2	16	3·29	...
42·8	·276	3·1	0·9	...	...	5·50	7·75	12·75	4·50	0·50	...	...	7·0	2·9	19	2·09	...
43·0	·278	3·2	1·3	...	...	7·00	6·50	7·75	8·25	0·50	...	...	9·7	11·3	12	1·63	...
46·2	·314	3·6	1·4	...	...	9·00	4·25	6·00	11·25	0·00	...	...	5·4	6·1	16	1·58	...
54·8	·429	4·8	1·0	...	...	2·50	4·50	12·50	10·50	0·00	...	...	6·3	8·3	22	4·12	...
59·0	·499	5·5	1·5	...	...	5·75	9·25	9·75	6·25	0·00	...	...	5·2	6·3	17	2·87	...
56·7	·461	5·1	1·7	...	...	7·75	6·50	7·75	8·50	0·00	...	...	4·7	5·9	17	3·28	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Appendix

TEMPLEMORE. Lat. 52° 48′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Mean				Maximum in Sun's rays.	Minimum on Grass.	Hygrometer.	
							Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.			Dry Bulb.	Wet Bulb.
January	...	...	...	54·2	19·6	34·6	46·0	29·4	16·6	37·7	54·0	...	41·3	40·1
February	...	...	...	54·6	26·4	28·2	50·1	34·0	16·1	42·0	75·1	...	45·8	44·3
March	...	...	...	61·4	25·2	36·2	52·1	34·0	18·1	43·0	86·2	...	47·0	45·1
April	...	...	...	66·4	25·0	41·4	57·6	35·0	22·6	46·3	101·0	...	51·1	48·1
May	...	...	...	58·4	28·0	40·4	59·0	37·5	21·5	48·2	109·0	...	53·6	50·4
June	...	...	...	72·4	35·0	37·4	65·5	45·2	20·3	55·3	115·3	...	59·1	55·6
July	...	...	...	83·6	40·0	43·6	70·9	49·7	21·2	60·3	115·4	...	64·6	61·3
August...	...	...	...	78·4	36·2	42·2	69·0	47·7	21·3	58·3	115·8	...	62·6	60·7
September	...	...	...	75·4	34·2	41·2	63·9	45·6	18·3	54·7	106·2	...	58·1	55·3
October	...	...	...	60·4	26·0	34·4	54·0	34·8	19·2	44·4	93·6	...	48·6	46·5
November	...	...	...	63·6	24·8	38·8	48·6	32·8	15·8	40·7	71·2	...	44·0	42·4
December	...	...	...	53·4	23·2	30·2	46·2	31·8	14·4	39·0	52·3	...	42·0	40·9
Yearly Sums, Means and Totals ...	...	...	...	66·0	28·6	37·4	56·9	38·1	18·8	47·5	91·3	...	51·5	49·2

Abstract of Results of Meteorological Observations

Stations, with their Height above the Sea.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Year.	Lowest during Year.	Range during Year.	Mean				Maximum in Sun's rays.	Minimum on Grass.	Hygrometer.	
							Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.			Dry Bulb.	Wet Bulb.
Athlone ... 304 ft.	...	...	...	80·9	21·9	59·0	58·7	37·9	20·8	48·3	...	...	51·4	48·6
Belfast ... 50 ,,	29·642	30·431	28·422	80·1 *	28·0 *	52·1 *	59·0 *	42·0 *	17·0 *	50·5 *	87·3 *	40·2 †	51·6 *	47·5
Buttevant ... 300 ,,	...	...	...	76·0	22·0	54·0	60·3	37·5	22·8	48·9	...	...	54·0	52·0
Cork ... 257 ft.	29·484	30·176	28·250	77·0	26·0	51·0	57·8	40·7	17·1	49·2	76·4	38·6	52·3 ‡	49·3 ‡
Curragh Camp 450 ,,	29·248	29·904	28·288	82·8	22·4	60·4	57·8	40·1	17·7	48·9	79·1	36·3	50·6	47·1
Dublin ... 72 ,,	29·544	30·260	28·394	86·0	20·0	66·0	58·6	40·6	18·0	49·6	97·7	36·4	52·4 §	49·1 §
Fermoy ... 176 ,,	...	...	...	77·5 ‖	19·0 ‖	58·5 ‖	56·5 ‖	39·6 ‖	16·9 ‖	48·1 ‖	...	...	50·3 ¶	48·2 ¶
Limerick** ... 75 ,,	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Templemore... 75 ,,	...	...	...	83·6	19·6	64·0	56·9	38·1	18·8	47·5	91·3	...	51·5	49·2

Athlone.—July observations for 29 day only.
* (Belfast).—For 11 months only.
† (Belfast).—For 9 months only.
‡ (Cork).—July 22 days only
§ (Dublin).—June 29 days only.
‖ (Fermoy).—For 9 months only.
¶ (Fermoy).—For 10 months only.
** Useless to summarize.

No. XVI—*continued.*

Long. 7° 49′ W. Height above Sea 75 feet.

Hygrometrical Results from Glaisher's Tables (edition).						Atmospherical Conditions.											
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	In a Cubic Foot of Air.			Mean Weight of Cubic Foot of Air.	Number of Days for mean Direction of Wind.				Number of Calm, or nearly calm, Days.	Calculated from Robinson's Anemometer.		Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	Amount of Rain fall.	
		Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.		North.	Eas	South.	West.		Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.				On the Ground.	Feet above the Ground.
																Inches	Inches
38·6	·234	2·7	0·3	90·7	...	3·00	1·25	11·50	15·25	0·00	...	...	7·8	4·4	27	5·02	...
42·6	·273	3·1	0·4	88·8	...	0·75	10·75	9·50	8·00	0·00	...	...	7·5	4·2	29	4·58	...
43·0	·277	3·2	0·5	86·7	...	5·75	7·00	6·75	11·50	0·00	...	...	7·9	4·2	16	2·22	...
45·0	·300	3·4	0·8	80·0	...	15·75	4·00	4·50	5·75	0·00	...	...	7·9	4·5	12	2·01	...
47·3	·325	3·7	1·0	78·8	...	19·00	2·00	1·75	8·25	0·00	...	...	8·0	4·4	21	1·86	...
52·5	·395	4·5	1·2	79·1	...	14·00	0·00	10·50	5·50	0·00	...	...	8·6	4·0	22	3·30	...
58·6	·493	5·4	1·3	80·8	...	12·25	0·25	16·50	2·00	0·00	...	...	7·5	3·5	15	2·38	...
59·1	·502	5·6	0·8	88·6	...	13·50	2·00	5·50	10·00	0·00	...	...	7·5	3·7	22	4·43	...
52·8	·400	4·5	0·9	82·3	...	17·25	0·00	6·25	6·50	0·00	...	...	8·0	3·0	26	3·14	...
44·2	·292	3·3	0·6	85·3	...	13·50	0·75	10·25	6·50	0·00	...	...	6·9	4·0	26	5·20	...
40·5	·252	2·9	0·4	87·2	...	10·25	0·00	6·50	13·25	0·00	...	...	7·2	3·7	24	4·68	...
39·6	·243	2·8	0·3	91·3	...	6·75	2·50	15·25	6·50	0·00	...	...	8·8	3·4	27	8·59	...
47·0	·332	3·8	0·7	84·9	...	131·75	30·50	104·75	99·00	0·00	...	...	7·8	3·9	267	47·41	...

taken at Stations in Ireland in the Year 1872.

Hygrometrical Results from Glaisher's Tables (edition).						Atmospherical Conditions.											
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	In a Cubic Foot of Air.			Mean Weight of Cubic Foot of Air.	Number of Days for mean Direction of Wind.				Number of Calm, or nearly calm, Days.	Calculated from Robinson's Anemometer.		Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	Rain fall on the Ground.	Latitude.	Longitude.
		Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.		North.	East.	South.	West.		Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.						
											lbs. per sq. foot.	Miles				Inches	° ′	° ′
45·8	·318	3·6	0·8	82·2	...	51·50	51·75	115·00	144·75	1·00	...	...	5·6	4·8	200	38·70	53·26 N	8·0 W.
44·4	·300	3·4	1·1	75·5	536·6	70·00	68·00	140·00	75·00	13·00	...	32·3	4·5	1·5	247	49·07	54·36 ,,	5·57 ,,
50·1	·376	4·2	0·6	87·0	...	35·75	127·50	133·25	69·50	0·00	...	...	5·5	7·6	269	49·99	52·14 ,,	8·40 ,,
*	*	*	*	*	*													
46·3	·322	3·6	0·9	80·6	533·0	92·25	33·75	94·75	145·25	0·00	...	155·7	7·6	4·6	191	72·84	51·53 ,,	8·20 ,,
43·5	·291	3·4	1·0	77·2	531·6	71·00	32·25	126·25	125·50	1·00	...	311·6	6·8	3·6	226	41·43	52·8 ,,	6·48 ,,
†	†	†	†	†	†	‡	‡	‡	‡	‡								
47·5	·339	3·8	0·8	84·0	534·6	30·00	72·25	110·25	150·00	3·00	...	101·0	6·7	4·8	225	32·97	53·25 ,,	6·20 ,,
§	§	§	§	§		§	§	§	§	§			§	§	§	§		
46·1	·315	3·5	0·6	85·9	...	66·50	45·75	93·00	98·75	0·00	...	...	4·7	4·6	221	37·86	52·2 ,,	8·18 ,,
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	52·40 ,,	8·36 ,,
47·0	·332	3·8	0·7	84·9	...	131·75	30·50	104·75	99·00	0·00	...	...	7·8	3·9	267	47·41	52·48 ,,	7·49 ,,

Athlone.—July observations for 29 days only.
* (Cork).—July 22 days only.
† (Dublin).—June 29 days only.
‡ (Dublin).—Half a day short.
§ (Fermoy).—For 10 months only.

APPENDIX

Abstract of Results of Meteorological Observations taken at Stations in

Cape of Good Hope. Lat. 34° 56′ S.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
							Mean.						Hygrometer.	
	Mean reduced and corrected to 32°.	Height reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.	Maximum in Sun's rays.	Minimum on Grass.	Dry Bulb.	Wet Bulb.
January	29·881	30·160	29·594	103·0	50·0	53·0	83·9	58·0	25·9	70·9	131·1	57·1	73·0	62·4
February	29·931	30·286	29·697	102·2	50·5	51·7	84·5	60·1	24·4	72·3	133·1	58·8	73·7	64·8
March	29·890	30·103	29·626	96·0	64·2	31·8	81·4	57·6	23·8	69·5	127·7	56·4	70·5	62·4
April	29·984	30·434	29·756	96·5	47·7	48·8	81·4	53·8	27·6	67·6	124·1	52·0	67·3	59·3
May	30·001	30·355	29·566	92·0	42·0	50·0	75·0	52·5	22·5	63·7	99·3	50·4	63·1	57·7
June	30·157	30·534	29·834	83·2	35·0	48·2	72·5	47·4	25·1	59·9	97·2	44·9	60·0	55·2
July	30·106	30·317	29·828	78·0	40·5	37·5	69·3	47·7	21·6	58·5	92·8	45·4	59·1	55·0
August	30·016	30·316	29·467	85·0	38·5	46·5	67·6	49·4	18·2	58·5	106·6	46·3	60·3	56·3
September ...	30·103	30·399	29·827	86·0	39·7	46·3	69·5	47·2	22·3	58·3	119·6	44·0	61·8	56·3
October... ...	30·078	30·190	29·743	98·0	45·0	53·0	75·5	52·0	23·5	63·7	126·4	49·0	66·2	60·5
November ...	29·946	30·276	29·787	99·7	44·0	55·7	76·3	54·0	22·3	65·1	127·6	51·9	68·1	61·1
December ...	29·880	30·151	29·720	99·0	51·0	48·0	81·4	56·3	25·1	68·8	130·3	54·6	72·4	64·7
Yearly Sums, Means, and Totals ...	29·997	30·232	29·620	93·2	45·7	47·5	76·5	53·0	23·5	64·7	118·0	50·9	66·3	59·6

Fort Napier, Natal. Lat. 29° 3′ S.

January	27·516	27·814	27·123	99·8	48·0	51·8	79·5	56·3	23·2	67·9	...	...	72·0	66·5
February	27·553	27·805	27·268	100·0	48·7	51·3	82·9	57·7	25·2	70·3	...	...	74·5	67·7
March	27·526	27·788	27·154	95·0	53·0	42·0	82·8	57·6	25·2	70·2	...	...	74·6	66·9
April	27·581	27·809	27·338	87·1	48·0	39·1	73·9	54·2	19·7	64·0	...	...	67·0	62·9
May	27·595	27·881	27·267	86·5	40·0	46·5	72·5	47·3	25·2	59·8	...	...	64·9	56·3
June	27·737	28·069	27·403	78·0	31·7	46·3	68·4	39·9	28·5	54·2	...	...	58·8	49·1
July	27·715	27·978	27·378	82·6	30·5	52·1	67·3	40·1	27·2	53·7	...	...	58·3	50·0
August	27·598	27·942	27·079	95·0	34·5	60·5	75·9	46·1	29·8	61·0	...	...	66·4	55·4
September ...	27·639	27·962	27·242	90·0	40·1	49·9	72·0	49·3	22·7	60·6	...	...	64·6	58·0
October ...	27·553	27·918	27·178	99·0	46·0	53·0	77·9	54·1	23·8	66·0	...	...	68·6	63·4
November ...	27·511	27·806	27·254	92·6	46·0	46·6	76·0	53·0	23·0	64·5	...	...	68·1	61·5
December ...	27·490	27·795	27·226	94·0	50·0	44·0	81·1	57·1	24·0	69·1	...	...	71·4	67·2
Sums, Means, and Totals ...	27·584	27·881	27·242	91·6	43·0	48·6	75·8	51·1	24·7	63·4	...	...	67·4	60·4

Hong Kong. Lat. 22° 16′ N.

January	30·138	30·357	29·844	71·0	45·0	26·0	63·7	54·0	9·7	58·8	91·5	46·6	60·2	54·9
February	30·136	30·375	29·862	75·0	38·5	36·5	63·0	46·9	16·1	54·9	99·6	42·5	57·7	42·4
March	29·995	30·295	29·739	81·5	44·0	37·5	71·8	55·8	16·0	63·8	108·0	52·7	66·6	62·1
April	29·949	30·103	29·754	93·0	57·0	36·0	84·4	68·9	15·5	76·6	122·0	60·1	77·6	71·3
May	29·802	29·937	29·628	95·0	71·0	24·0	87·2	75·9	11·3	81·5	126·2	67·6	82·7	76·3
June	29·757	29·924	29·576	96·5	75·0	21·5	90·5	79·3	11·2	84·9	130·0	70·9	85·1	79·7
July	29·730	29·893	29·477	99·0	77·0	22·0	92·8	79·4	13·4	86·1	155·6	70·2	86·7	80·4
August	29·685	29·901	29·369	98·0	77·0	21·0	93·2	79·6	13·6	86·4	139·0	70·4	86·3	80·4
September ...	29·800	29·923	29·667	97·0	74·0	23·0	89·6	76·5	13·1	83·0	135·6	59·9	83·3	75·6
October... ...	29·913	30·120	29·673	88·0	65·0	23·0	82·9	71·9	11·0	77·4	121·6	48·6	77·7	71·1
November ...	30·036	30·277	29·785	82·0	57·0	25·0	76·0	66·0	10·0	71·0	112·0	40·6	71·6	64·1
December ...	30·027	30·326	29·803	97·0	64·0	13·0	71·5	61·2	10·3	66·3	93·4	35·8	67·0	60·8
Yearly Sums, Means, and Totals ...	29·914	30·120	29·681	87·7	62·0	25·7	80·5	67·9	12·6	74·2	117·9	55·5	75·2	68·3

No. XVII.

Cape of Good Hope, China, and Straits Settlements in the Year 1872.

Long. 18° 27′ E. Height above Sea 27 feet.

Hygrometrical Results from Glaisher's Tables (edition).						Atmospherical Conditions.											
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.					Amount of Rain fall.	
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, Days.	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	On the Ground.	25 Feet above the Ground.
											lbs. per sq. foot	Miles				Inches	Inches
54·6	·427	4·6	4·2	52·2	518·5	...	...	...	...	...	...	...	2·6	1·7	4	0·75	...
58·3	·490	5·3	3·7	59·1	518·2	...	...	...	...	...	...	...	2·3	1·2	3	0·21	...
56·2	·452	5·0	3·2	60·6	520·9	...	...	...	...	...	...	...	3·7	1·6	4	0·87	...
52·9	·402	4·4	2·9	60·0	526·0	...	...	...	...	...	...	...	3·3	1·6	1	0·28	...
53·3	·405	4·5	1·9	70·1	530·5	...	...	...	...	...	...	...	5·2	2·1	13	3·89	...
51·0	·374	4·2	1·6	72·0	536·6	...	...	...	...	...	...	...	4·2	4·3	13	3·63	...
51·3	·379	4·3	1·3	75·5	536·6	...	...	...	...	...	...	...	4·7	3·9	11	2·29	...
52·8	·400	4·5	1·4	76·3	533·5	...	...	...	...	...	...	...	5·5	5·6	15	4·57	...
51·6	·382	3·2	1·9	69·5	533·7	...	...	...	...	...	...	...	3·0	4·7	8	1·27	...
55·9	·447	4·9	2·1	69·7	528·4	...	...	...	...	...	...	...	4·8	4·1	6	0·54	...
55·6	·443	4·8	2·7	64·0	524·3	...	...	...	...	...	...	...	4·3	3·3	4	0·59	...
58·9	·500	5·4	3·2	62·2	518·5	...	...	...	...	...	...	...	3·9	2·4	3	0·53	...
54·4	·425	4·6	2·5	65·9	527·1	...	...	...	...	...	...	...	3·9	3·0	85	19·42	...

Long. 30° 2′ E. Height above Sea 2,200 feet.

62·3	·564	6·1	3·4	71·5	477·6	5·00	16·25	6·75	1·50	1·50	...	...	8·0	4·6	15	3·36	...
62·7	·571	6·2	3·1	66·8	475·9	5·25	16·75	5·00	1·50	0·50	...	...	8·3	4·2	9	1·16	...
61·3	·543	5·9	3·4	63·2	475·6	5·25	18·75	5·50	1·50	0·00	...	...	6·2	4·4	17	6·29	...
57·4	·471	5·1	2·4	68·5	482·9	3·25	15·00	7·25	3·50	1·00	...	...	6·8	5·0	16	8·00	...
49·2	·350	3·9	2·9	56·6	486·7	5·00	15·00	8·00	2·50	0·50	...	...	5·6	5·3	7	1·47	...
40·4	·251	2·8	2·7	50·2	485·6	1·25	11·75	8·00	4·00	5·00	...	...	3·3	4·4	5	0·23	...
42·6	·273	3·1	2·4	55·8	495·6	3·50	12·75	6·50	2·75	5·50	...	...	4·4	4·7	4	0·49	...
46·5	·317	3·5	3·6	48·4	485·8	4·00	13·00	6·25	4·25	3·50	...	...	3·1	4·4	3	0·20	...
52·5	·396	4·4	2·3	64·6	487·4	6·25	17·00	4·25	2·50	0·00	...	...	7·0	5·3	14	3·54	...
59·3	·505	5·6	2·1	72·0	481·5	3·50	19·75	5·00	2·25	0·50	...	...	7·8	5·5	17	3·19	...
56·3	·454	5·0	2·5	65·6	481·6	5·50	14·75	7·00	2·25	0·50	...	...	7·8	5·6	21	7·84	...
64·0	·597	6·5	1·8	77·0	477·3	4·75	20·75	2·75	2·75	0·00	...	...	6·9	6·0	22	4·46	...
54·5	·441	4·8	2·6	63·2	482·8	52·50	191·50	72·25	31·25	18·50	...	...	6·3	4·9	150	40·33	...

Long. 114° 9′ E. Height above Sea 43 feet.

50·2	·364	4·0	1·8	69·7	536·1	1·75	20·00	0·00	4·75	4·50	...	...	1·7	2·6	1	0·05	0·05
47·6	·330	3·7	1·6	69·2	538·9	1·25	18·25	0·00	3·50	6·00	...	...	1·8	2·6	3	0·81	0·70
58·5	·491	5·4	1·8	75·5	526·4	0·75	22·50	0·00	2·25	5·50	...	...	2·4	2·8	3	0·29	0·24
66·9	·660	7·1	3·1	69·8	513·6	0·25	22·00	4·25	2·50	1·00	...	...	3·6	2·5	4	1·03	0·84
72·1	·785	8·4	3·5	70·4	505·6	9·75	13·75	5·25	2·25	0·00	...	...	6·8	*	19	8·69	6·04
76·2	·905	9·5	3·3	74·4	501·9	3·25	8·00	9·75	8·00	1·00	...	...	6·0	*	22	21·19	16·47
76·4	·910	9·6	4·0	70·8	500·0	2·50	16·25	6·75	4·50	1·00	...	...	4·7	*	18	17·89	12·51
76·6	·918	9·7	3·6	72·4	499·5	7·25	5·75	8·00	9·00	1·00	...	...	4·1	3·1	14	12·30	9·37
70·5	·745	7·9	4·2	65·5	505·2	6·00	14·75	4·25	3·00	2·00	...	...	3·7	5·5	12	10·29	8·99
66·5	·651	7·0	3·2	68·6	513·0	8·25	17·00	0·75	2·50	2·50	...	...	4·3	5·9	8	9·80	6·95
58·4	·491	5·4	3·0	63·0	522·0	10·00	17·75	0·25	1·50	0·50	...	...	1·6	5·1	1	0·07	0·05
55·8	·447	4·9	2·4	67·2	526·8	10·00	14·00	0·00	0·00	7·00	...	...	2·0	5·4	3	0·36	0·31
64·6	·641	6·9	3·0	69·7	515·7	61·00	190·00	39·25	43·75	32·00	...	...	3·5	3·9	108	82·77	62·52

* No Papers.

Appendix

Abstract of Results of Meteorological Observations taken at Stations in Singapore. Lat. 1° 16′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
							Mean						Hygrometer.	
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.	Maximum in Sun's rays.	Minimum on Grass.	Dry Bulb.	Wet Bulb.
January	29·303	29·378	29·194	105·4	67·2	38·2	98·4	68·8	29·6	83·6	145·9	66·6	81·6	76·8
February	29·310	29·378	29·230	108·4	68·2	40·2	99·5	69·7	29·8	84·6	108·4	68·2	80·0	76·8
March	29·314	29·439	29·249	108·3	69·0	39·3	101·9	70·5	31·4	86·2	150·4	68·6	84·3	81·2
April	29·286	29·481	29·136	109·0	69·0	40·0	97·5	71·3	26 2	84·4	146·4	68·9	85·5	81·0
May	29·237	29·383	29·126	102·0	68·4	33·6	96·6	71·5	25·1	84·0	144·7	69·9	86·4	81·0
June	29·221	29·346	29·087	100·2	67·0	33·2	94·1	71·7	22·4	82·9	139·3	70·1	85·6	80·4
July	29·263	29·352	29·168	101·6	65·6	36·0	92·6	70·7	21·9	81·6	132·0	67·9	84·0	79·5
August	29·240	29·290	29·161	97·0	66·0	31·0	91·8	70·0	21·8	80·9	136·6	67·6	83·9	79·6
September	29·270	29·395	29·146	104·6	66·6	38·0	93·7	69·8	23·9	81·7	141·9	67·6	84·5	79·4
October...	29·252	29·330	29·183	104·2	66·6	37·6	93·5	69·3	24·2	81·4	140·9	67·3	84·4	80·0
November	29·244	29·356	29·128	98·0	67·2	30·8	92·8	69·1	23·7	80·9	138·7	67·4	84·5	80·3
December	29·246	29·384	29·163	94·8	67·2	27·6	90·7	69·0	21·7	79·8	138·0	67·2	84·1	80·0
Yearly Sums, Means, and Totals ...	29·265	29·376	29·164	102·8	67·3	35·5	95·3	70·1	25·2	82·7	138·6	68·1	84·1	79·7

Abstract of Results of Meteorological Observations taken at Stations in

Stations, with their Height above the Sea.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
							Mean.						Hygrometer.	
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Year.	Lowest during Year.	Range during Year.	Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.	Maximum in Sun's rays.	Minimum on Grass.	Dry Bulb.	Wet Bulb.
feet														
Cape of Good Hope ... 27	29·997	30·534	29·467	103·0	35·0	68·0	76·5	53·0	23·5	64·7	118·0	50·9	66·3	59·6
Fort Napier, Natal ... 2,157	27·584	28·069	27·079	100·0	30·5	69·5	75·8	51·1	24·7	63·4	...	...	67·4	60·4
Hong Kong, China ... 43	29·914	30·375	29·369	99·0	38·5	60·5	80·5	67·9	12·6	74·2	117·9	55·5	75·2	68·3
Singapore 116	29·265	29·481	29·087	109·0	65·6	43·4	95·3	70·1	25·2	82·7	138·6	68·1	84·1	79·7

No. XVII—*continued.*

Cape of Good Hope, China, and Straits Settlements, in the year 1872.

Long. 105° 31′ E. Height above Sea 116 feet.

Hygrometrical Results from Glaisher's Tables (edition).						Atmospherical Conditions.											
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.					Amount of Rain fall.	
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, Days.	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of days on which Rain fell.	On the Ground.	Feet above the Ground.
												Miles.				Inches	Inches
73·6	·829	8·8	2·7	76·8	497·8	...	...	...	...	...	...	73·2	5·9	4·6	3	1·59	...
74·7	·857	9·2	1·8	84·0	499·4	...	...	...	...	...	...	67·4	6·4	4·9	20	15·20	...
79·2	·996	10·5	2·0	84·8	494·6	...	...	...	...	...	...	67·9	4·0	5·0	9	5·16	...
78·1	·964	10·2	2·8	78·0	493·4	...	...	...	...	...	...	...	6·6	4·4	11	4·87	...
77·6	·947	10·2	3·3	75·4	491·7	...	...	...	...	...	...	85·9	5·4	3·5	10	5·32	...
77·0	·932	9·8	3·2	75·2	492·3	...	...	...	...	...	...	89·3	6·0	3·5	15	3·97	...
76·5	·913	9·7	2·7	78·0	494·5	...	...	...	...	...	...	113·1	7·0	4·0	15	6·06	...
76·8	·919	9·8	2·5	79·4	494·2	...	...	...	...	...	...	107·2	7·3	3·2	13	7·77	...
76·1	·900	9·5	3·1	75·6	494·3	...	...	...	...	...	...	123·3	6·1	3·2	16	7·56	...
77·2	·932	9·9	2·6	78·4	493·9	...	...	...	...	...	...	114·0	6·8	3·0	22	5·30	...
77·6	·936	10·0	2·5	79·5	493·6	...	...	...	...	...	...	114·5	7·5	3·0	24	10·93	...
77·3	·946	10·0	2·5	79·6	494·0	...	...	...	...	...	...	124·4	7·0	3·1	22	7·98	...
76·8	·923	9·8	2·6	78·7	494·5	...	...	...	...	...	...	98·2	6·3	3·7	180	81·71	...

Cape of Good Hope, China, and Straits Settlements, in the Year 1872.

Hygrometrical Results from Glaisher's Tables (edition).						Atmospherical Conditions.											
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.						
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, Days.	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	Rainfall on the Ground.	Latitude.	Longitude.
												Miles.				Inches.	° ′	° ′
54·4	·425	4·6	2·5	65·9	527·1	...	...	...	...	...	...	...	3·9	3·0	85	19·42	34 56 S.	18 27 E.
54·5	·441	4·8	2·6	63·3	482·8	52·50	191·50	72·25	31·25	18·50	...	...	6·3	4·9	150	40·33	29 3 „	30 2 „
64·6	·641	6·9	3·0	69·7	515·7	61·00	190·00	39·25	43·75	32·00	...	...	3·5	3·9	108	82·77	22 16 N.	114 9 „
76·8	·923	9·8	2·6	78·7	494·5	...	...	...	...	...	...	98·2	6·3	3·7	180	81·71	1 16 „	105 31 „

Appendix

Abstract of Results of Meteorological Observations taken at

HALIFAX, NOVA SCOTIA. Lat. 44° 39′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
							Mean						Hygrometer.	
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.	Maximum in Sun's rays.	Minimum on Grass.	Dry Bulb.	Wet Bulb.
January	29·582	30·372	29·110	46·0	3·0	49·0	32·0	15·1	16·9	23·5	61·7	14·5	25·4	23·8
February	29·608	30·405	28·829	44·3	0·0	44·3	33·8	14·3	19·5	24·0	82·6	*	26·3	24·2
March	29·567	30·156	28·745	47·3	8·9	56·2	33·9	12·4	21·5	23·1	89·5	*	26·7	24·0
April	29·634	30·133	29·073	60·0	16·3	43·7	48·8	27·8	21·0	38·3	97·5	23·3	42·2	38·5
May	29·707	30·207	29·165	73·0	25·7	47·3	60·5	36·2	24·3	48·3	103·0	31·6	50·8	47·0
June	29·748	30·085	29·345	89·6	36·2	53·4	70·9	45·8	25·1	58·3	113·6	42·9	60·9	57·4
July	29·690	30·015	29·414	90·2	44·9	45·3	79·7	52·6	27·1	66·1	127·1	46·9	69·7	63·0
August	29·828	30·073	29·393	93·0	43·8	49·2	76·7	53·7	23·0	65·2	119·2	50·0	68·2	63·6
September	29·818	30·252	29·322	84·1	38·7	45·4	70·2	48·3	21·9	59·2	114·1	43·7	62·4	58·4
October	29·857	30·374	29·266	72·3	28·9	43·4	60·3	38·7	21·6	49·5	99·9	33·5	52·4	48·5
November	29·735	30·347	29·894	58·6	17·9	40·7	46·0	28·7	17·3	37·3	72·8	23·6	39·8	37·0
December	29·724	30·252	28·928	48·0	6·6	54·6	31·1	13·1	18·0	22·1	58·8	15·0	23·8	22·2
Yearly Sums, Means, and Totals ...	29·709	30·223	29·124	67·2	19·5	47·7	53·6	32·2	21·4	42·9	95·0	29·5	45·7	42·3

BARBADOES. Lat. 13° 4′ N.

January	30·006	30·095	29·906	86·5	69·5	17·0	85·2	72·4	12·8	78·8	139·3	67·8	80·8	72·7
February	30·011	30·141	29·940	88·5	70·0	18·5	85·3	71·8	13·5	78·5	142·1	67·5	81·4	72·8
March	30·013	30·111	29·908	88·5	69·5	19·0	86·6	72·5	14·1	79·5	143·5	67·8	82·3	72·1
April	29·993	30·119	29·884	89·6	67·5	22·1	87·0	72·2	14·8	79·6	144·6	68·1	82·7	72·4
May	30·007	30·125	29·886	90·6	72·5	18·1	88·6	74·8	13·8	81·7	143·8	71·4	84·2	74·3
June	30·029	30·131	29·937	90·0	72·6	17·4	88·4	75·9	12·5	82·1	141·2	73·0	83·8	75·2
July	30·022	30·113	29·924	91·2	73·0	18·2	88·5	75·2	13·3	81·8	143·0	71·7	84·7	75·8
August	29·962	30·061	29·882	91·2	74·0	17·2	88·9	75·9	13·0	82·4	143·6	72·7	85·2	76·8
September	29·954	30·069	29·760	93·2	68·0	25·2	89·3	75·6	13·7	82·4	144·9	72·4	85·6	77·0
October	29·924	29·996	29·832	91·0	72·6	18·4	88·7	75·1	13·6	81·9	144·9	70·7	85·0	77·4
November	29·898	30·081	29·754	89·0	71·6	17·4	86·3	74·2	12·1	80·2	139·4	71·0	82·5	76·0
December	29·965	30·058	29·858	86·5	69·8	16·7	84·9	72·6	12·3	78·7	136·9	69·1	80·9	73·7
Sums, Means, and Totals ...	29·982	30·092	29·872	89·6	70·9	18·7	87·3	74·0	13·3	80·6	142·3	70·3	83·3	74·7

NEWCASTLE, JAMAICA. Lat. 18° 6′ N.

January	...	...	...	80·0	52·0	28·0	74·4	56·0	18·4	65·2	130·4	45·4	67·0	63·9
February	...	...	...	86·0	54·0	32·0	78·6	60·4	18·2	69·5	136·5	60·7	68·5	64·7
March *	...	...	...	86·0	50·0	36·0	77·6	64·8	12·8	71·2	137·0	61·5	67·7	63·8
April	...	...	...	92·0	54·0	38·0	78·3	64·7	13·5	71·5	136·7	59·3	69·2	65·5
May	...	...	...	99·0	52·0	47·0	82·0	63·8	18·2	72·9	132·4	66·3	71·2	66·4
June	...	...	...	95·0	62·0	33·0	83·8	69·1	14·7	76·5	138·4	...	73·3	67·3
July	...	...	...	97·0	62·0	35·0	85·0	67·2	17·8	76·1	138·0	...	72·7	67·2
August	...	...	...	95·0	62·0	33·0	84·8	68·3	16·5	76·5	136·7	...	72·0	67·7
September	...	...	...	94·0	58·0	36·0	84·1	63·0	21·1	73·5	138·3	...	72·3	68·0
October	...	...	...	90·0	56·0	34·0	82·3	59·1	23·2	70·9	143·3	...	72·0	67·8
November	...	...	...	90·0	55·0	35·0	80·4	58·8	21·6	69·6	137·5	...	71·3	67·0
December	...	...	...	89·0	53·0	36·0	78·3	55·6	22·7	66·9	134·9	...	69·8	65·1
Sums, Means, and Totals	...	...	...	91·0	55·8	35·2	80·8	62·6	18·2	71·7	136·7	...	70·6	66·2

* Covered with Snow.

No. XVII—*continued.*

Stations in North America and the West Indies, in the Year 1872.

Long. 63° 36′ W. Height above Sea 175 feet.

Hygrometrical Results from Glaisher's Tables (edition).						Atmospherical Conditions.											
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.					Amount of Rain fall.	
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, days.	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of days on which rain fell.	On the Ground.	40 Feet above the Ground.
											lbs. per sq. foot	Miles				Inches	Inches
13·4	·087	1·0	0·6	63·6	566·1	20·75	0·50	3·25	6·50	0·00	...	276·7	7·1	3·7	8	3·27	2·46
13·9	·083	1·0	0·7	58·0	565·5	20·50	2·25	2·25	4·00	0·00	...	295·3	6·4	3·3	8	3·47	2·22
11·2	·072	0·9	0·8	50·3	564·4	27·00	0·75	2·00	1·25	0·00	...	350·4	6·6	4·1	15	7·37	*
34·0	·192	2·3	0·8	73·8	547·2	16·00	3·25	6·50	4·25	0·00	...	226·8	6·8	4·2	10	4·33	2·12
43·0	·278	3·2	1·0	75·2	538·7	10·00	1·50	10·00	9·50	0·00	...	249·7	8·2	3·4	17	3·59	1·71
54·4	·423	4·8	1·2	79·9	528·1	10·50	2·75	9·25	7·50	0·00	...	180·4	7·5	2·6	17	6·29	†
57·8	·478	5·2	2·7	65·2	518·0	15·00	2·00	6·50	7·50	0·00	...	221·8	5·8	3·4	10	3·11	2·61
60·0	·518	5·7	1·9	75·0	521·6	8·50	2·00	9·75	10·75	0·00	...	233·0	7·4	2·4	10	7·36	6·30
55·0	·433	4·8	1·5	77·0	527·8	8·25	0·00	3·75	18·00	0·00	...	218·7	6·6	3·2	9	1·44	1·07
44·5	·294	3·4	1·1	75·0	539·8	2·00	2·00	9·75	17·25	0·00	...	253·6	5·6	2·8	13	4·72	4·07
33·4	·191	2·2	0·6	77·6	551·7	5·50	2·75	7·75	14·50	0·00	...	256·6	7·3	2·8	17	8·50	5·03
12·7	·076	0·9	0·6	61·0	561·1	8·00	4·25	4·75	12·00	2·00	...	†	6·9	3·9	19	‡	§
36·1	·260	2·9	1·1	69·3	544·2	151·50	24·00	75·50	113·00	2·00	...	251·2	6·8	3·3	153	53·25	27·50

Long. 59° 40′ W. Height above Sea 25 feet.

67·2	·668	7·2	4·1	63·4	511·5	15·50	15·50	0·00	0·00	0·00	...	205·6	5·2	5·5	14	1·59	0·63 ‖
67·0	·662	7·1	4·4	62·0	511·6	4·75	15·00	9·25	0·00	0·00	...	185·7	4·4	5·7	15	2·08	0·89
65·3	·623	6·7	5·1	56·4	510·6	13·75	16·75	1·50	0·00	0·00	...	230·4	4·8	5·1	12	0·66	0·03
65·6	·629	6·7	5·2	56·1	509·8	9·25	20·50	0·25	0·00	0·00	...	196·9	4·8	5·0	8	1·09	0·53
67·8	·680	7·2	5·3	57·0	508·3	9·00	21·25	0·75	0·00	0·00	...	229·5	5·1	4·8	15	1·07	0·18
69·5	·721	7·6	4·7	62·4	508·7	11·50	16·00	2·50	0·00	0·00	...	279·8	6·0	5·0	17	2·96	1·72
69·9	·734	7·8	4·8	61·1	507·8	9·50	19·00	2·00	0·00	0·50	...	187·8	4·6	5·0	18	3·38	1·95
71·3	·769	8·2	4·7	62·8	506·0	12·75	18·00	0·25	0·00	0·00	...	¶	5·2	5·5	23	3·55	2·14
71·4	·770	8·2	4·9	62·2	505·5	8·75	15·75	5·50	0·00	0·00	...	¶	4·5	4·8	18	11·38	9·20
72·4	·799	8·5	4·4	65·6	505·4	5·25	17·00	8·75	0·00	0·00	...	¶	5·2	5·4	13	5·31	4·19
71·7	·775	8·3	3·5	70·0	507·4	12·50	15·50	1·00	0·00	1·00	...	188·8	5·7	6·0	28	9·18	7·28
68·8	·706	7·5	3·8	66·2	510·7	13·50	17·00	0·50	0·00	0·00	...	213·5	5·4	5·9	28	6·44	4·83
69·0	·711	7·6	4·6	62·1	508·6	125·00	207·25	32·25	0·00	1·50	...	213·1	5·1	5·3	209	48·69	33·57

Long. 76° 42′ W. Height above Sea 3,800 feet.

51·4	·546	5·9	1·3	82·5	...	12·75	14·25	0·00	0·00	4·00	...	...	1·4	5·2	12	2·56	4·30
61·7	·550	6·0	1·7	79·0	...	9·75	6·75	0·00	0·00	12·50	...	...	1·3	5·4	7	3·84	5·53
60·9	·532	5·8	1·7	78·5	...	9·50	6·50	0·00	0·50	14·50	...	...	1·1	5·5	15	7·18	11·84
62·6	·556	6·3	1·6	79·5	...	5·00	9·00	0·00	0·00	16·00	...	...	1·7	5·3	14	6·57	11·06
62·8	·572	6·2	2·2	74·2	...	1·25	7·25	0·00	0·50	22·00	...	...	1·2	5·2	13	3·35	6·34
62·9	·575	6·3	2·6	70·0	...	1·75	7·25	0·00	0·00	21·00	...	...	0·4	5·2	2	0·35	0·32
63·1	·579	6·2	2·5	72·2	...	1·50	9·00	0·00	0·00	20·50	...	...	0·4	5·2	9	4·84	12·50
64·5	·606	6·6	1·9	77·5	...	2·25	7·00	0·00	0·75	21·00	...	...	9·0	5·3	18	7·65	14·20
64·8	·613	6·6	1·9	77·8	...	2·00	7·00	0·00	0·00	21·00	...	...	1·3	5·3	17	9·88	23·27
64·6	·610	6·6	1·9	78·0	...	2·25	5·75	0·00	0·00	23·00	...	...	1·7	5·2	17	14·07	27·63
63·8	·591	6·4	1·9	76·5	...	3·25	10·75	0·00	0·00	16·00	...	...	1·1	5·3	7	1·43	1·91
61·4	·544	6·0	2·0	74·5	...	2·00	8·00	0·00	0·50	20·50	...	...	1·4	5·3	14	4·60	7·35
62·0	·573	6·2	1·9	76·7	...	53·25	98·50	0·00	2·25	212·00	...	...	1·8	5·3	145	66·32	126·95

* Frozen in position. † Out of order. ‡ Rain and Snow. § Frozen.
‖ 32 ft. above the ground. ¶ Broken.

Appendix

Abstract of Results of Meteorological Observations taken at

Up Park Camp, Jamaica. Lat. 17° 59′ N.

Month.	Readings of the Barometer. Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Temperature of the Air. Highest during Month.	Lowest during Month.	Range during Month.	Mean. Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.	Mean Daily Readings of Maximum in Sun's rays.	Minimum on grass.	Hygrometer. Dry Bulb.	Wet Bulb.
January	...	...	...	...	...	...	...	...	...	...	...	...	...	...
February	...	...	...	...	...	...	...	...	...	...	...	...	...	...
March	...	...	...	...	...	...	...	...	...	...	...	...	...	...
April	...	...	...	100·0	61·0	39·0	93·7	63·8	29·9	78·7	139·9	60·9	83·3	73·6
May	...	...	...	99·0	51·0	48·0	94·3	62·8	31·5	78·5	138·5	62·6	84·1	74·3
June	...	...	...	99·5	62·0	37·5	95·7	64·6	31·1	80·1	138·1	64·0	86·0	75·0
July	...	...	...	99·5	62·5	37·0	95·4	65·1	30·3	80·2	143·1	63·8	86·1	75·4
August	...	...	...	105·0	62·5	42·5	96·3	64·8	31·5	80·5	139·0	63·5	85·1	76·0
September	...	...	...	102·5	64·5	38·0	97·9	67·3	30·6	82·6	144·0	64·3	86·5	76·3
October...	...	...	...	101·5	65·0	36·5	97·5	67·9	29·6	82·7	145·7	63·5	86·0	76·0
November	...	...	...	101·5	64·0	37·5	97·1	67·0	30·1	82·0	144·9	61·8	85·1	74·7
December	...	...	...	98·5	62·0	36·5	94·7	64·4	30·3	79·5	144·8	58·9	83·3	72·9
Sums, Means, and Totals ...	...	...	...	100·8	61·6	39·2	95·8	65·3	30·5	80·5	141·7	62·6	85·0	74·9

Nassau, Bahamas. Lat. 25° 5′ N.

January	30·034	30·211	29·796	...	...	...	...	...	...	...	...	...	72·4	66·9
February	29·961	30·213	29·750	...	...	...	...	...	...	...	...	...	72·2	67·1
March	30·025	30·220	29·815	...	...	...	...	...	...	...	...	...	73·1	67·8
April	29·965	30·124	29·836	96·0	61·0	35·0	88·8	64·7	24·1	76·7	144·7	55·8	79·2	72·0
May	29·963	30·068	29·844	90·0	63·0	27·0	83·0	65·9	22·1	75·4	147·0	53·1	78·9	74·1
June	29·967	30·162	29·852	95·0	61·0	34·0	88·8	64·5	24·3	76·6	147·0	57·5	81·5	77·9
July	30·013	30·091	29·867	95·0	62·0	33·0	89·1	63·6	25·5	76·3	148·7	51·6	82·3	78·8
August	29·932	30·033	29·744	99·0	57·0	42·0	93·1	63·7	29·4	78·4	149·4	47·2	85·4	80·2
September	29·905	30·031	29·828	95·0	65·0	30·0	91·2	69·1	22·1	80·1	146·4	58·6	85·7	81·0
October	29·857	29·997	29·690	96·0	63·0	33·0	86·7	69·6	17·0	78·1	139·3	57·4	81·5	77·4
November	29·975	30·115	29·883	90·0	60·0	30·0	84·4	66·7	17·7	75·5	133·4	56·1	81·1	76·9
December	30·170	30·216	29·875	86·0	58·0	28·0	80·8	64·1	16·7	72·5	116·8	58·4	78·6	69·9
Yearly Sums, Means, and Totals ...	29·980	30·126	29·815	93·5*	61·1*	32.4*	87·9*	65·7*	22·1*	76·6*	141·9	47·7*	79·3	74·2

Bermuda. Lat. 32° 17′ N.

January	29·895	30·322	29·430	78·0	45·5	32·5	70·7	57·6	13·1	64·1	107·2	46·1	66·7	60·0
February	29·779	29·274	29·321	77·0	42·5	34·5	70·6	57·8	12·8	64·2	128·2	47·3	65·1	59·1
March	29·835	30·158	29·533	76·0	39·0	37·0	69·2	54·7	14·5	61·9	125·6	43·5	63·5	57·3
April	29·928	30·192	29·677	78·5	39·5	39·0	72·1	56·8	15·3	64·4	136·4	45·7	68·0	61·4
May	29·941	30·164	29·656	87·0	52·0	35·0	79·4	59·5	19·9	69·4	140·1	53·9	68·9	75·6
June	29·935	30·107	29·629	89·5	56·5	33·0	85·3	68·4	16·9	76·8	147·6	59·3	80·1	74·6
July	29·958	30·121	29·777	92·8	64·0	28·8	88·8	72·8	16·0	80·8	149·5	64·4	84·0	77·2
August	29·919	30·116	29·410	94·2	65·0	29·2	90·1	73·7	16·4	81·9	150·0	66·0	85·6	78·3
September	29·862	30·069	29·403	92·5	59·0	33·5	85·0	70·8	14·2	77·9	141·6	61·5	81·0	73·2
October	29·805	30·062	29·449	85·0	56·0	29·0	81·2	67·4	13·8	74·3	132·8	58·0	77·1	70·0
November	29·909	30·104	29·635	81·2	52·8	28·4	76·5	58·5	18·0	67·5	121·2	54·9	72·0	66·8
December	30·023	30·290	29·535	78·0	48·0	30·0	71·3	59·1	12·2	65·2	112·6	48·4	67·5	62·0
Yearly Sums, Means, and Totals ...	29·899	30·081	29·538	84·1	51·6	32·5	78·3	63·1	15·2	70·7	132·7	54·1	73·3	67·9

* For 9 Months only.

No. XVII—*continued.*

Stations in North America and the West Indies, in the Year 1872.

Long. 76° 56′ W. Height above Sea 225 feet.

Hygrometrical Results from Glaisher's Tables (edition).						Atmospherical Conditions.											
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.					Amount of Rain fall.	
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, Days.	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	On the Ground.	Feet above the Ground.
											lbs. per sq. foot	Miles				Inches	Inches
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
67·1	·665	7·1	5·0	57·9	...	1·25	7·00	14·25	7·50	0·00	...	105·8	5·0	4·7	4	2·29	2·15
67·8	·682	7·2	5·2	57·6	...	4·50	17·50	8·75	0·25	0·00	...	100·9	5·3	4·3	4	2·66	1·93
67·9	·681	7·2	6·0	55·0	...	2·50	15·50	11·50	0·50	0·00	...	99·3	4·9	3·3	5	1·47	1·32
68·5	·696	7·3	5·9	55·9	...	3·20	15·50	12·00	0·25	0·00	...	92·2	4·8	3·1	5	1·96	1·77
70·0	·736	7·8	5·1	60·7	...	3·25	16·75	10·50	0·50	0·00	...	98·8	4·5	3·5	11	4·81	3·43
69·7	·727	7·6	5·7	57·4	...	3·25	14·50	11·75	0·50	0·00	...	101·4	5·1	4·9	8	0·85	0·69
69·5	·721	7·6	5·6	58·0	...	3·00	14·50	13·00	0·50	0·00	...	103·7	3·6	4·9	4	0·61	0·52
67·5	·685	7·3	5·6	56·8	...	4·25	14·50	11·00	0·25	0·00	...	96·2	2·3	4·4	4	1·60	1·53
65·9	·639	6·8	5·3	55·8	...	6·75	13·75	9·75	0·25	0·50	...	104·5	3·1	3·7	10	3·62	3·36
68·2	·692	7·3	5·5	57·2	...	32·00	129·50	102·50	10·50	0·50	...	100·3	4·3	4·1	55	19·27	16·70
						275 days only.											

Long. 77° 21′ W. Height above Sea 44 feet.

62·7	·572	6·2	2·4	71·9	520·6	14·50	9·00	2·50	5·00	0·00	...	...	6·0	...	4	1·99	1·30
63·2	·582	6·3	2·3	73·7	519·5	9·00	7·00	6·00	7·00	0·00	...	...	5·1	...	3	1·12	0·80
63·9	·595	6·5	2·3	72·8	519·8	11·00	11·00	6·50	2·50	0·00	...	...	5·1	3·9	2	1·10	0·70
67·1	·663	7·2	3·5	66·2	512·4	8·00	13·00	7·00	2·00	0·00	...	...	4·2	4·3	2	2·45	1·73
70·8	·755	8·1	2·5	75·9	511·2	7·50	14·00	9·00	0·50	0·00	...	...	5·6	4·2	8	4·78	3·75
75·5	·883	9·4	2·1	82·5	508·8	2·50	13·00	12·00	2·50	0·00	...	...	5·1	5·3	8	3·57	2·33
76·5	·910	9·7	2·1	82·8	508·8	11·00	15·00	5·00	0·00	0·00	...	...	5·1	4·9	11	13·29	8·51
76·8	·925	9·7	3·2	75·2	504·4	6·50	13·00	9·00	2·50	0·00	...	...	5·3	4·7	16	14·36	11·34
78·0	·960	10·2	2·9	77·2	503·4	5·50	12·50	8·50	3·50	0·00	...	...	5·1	4·8	11	9·02	6·53
74·6	·859	9·2	2·3	80·0	507·1	12·00	14·00	4·00	1·00	0·00	...	...	5·6	4·1	10	6·35	4·59
74·0	·842	9·0	3·2	77·2	510·2	10·50	14·50	4·50	0·50	0·00	...	...	5·0	4·7	4	4·54	3·69
63·9	·594	6·4	4·1	60·8	516·3	10·50	14·00	5·50	1·00	0·00	...	...	5·3	3·5	4	1·41	0·90
70·6	·762	8·2	2·7	74·7	511·9	108·50	150·00	79·50	28·00	0·00	...	...	5·2	4·4	83	63·98	46·17

Long. 64° 47′ W. Height above Sea 120 feet.

54·6	·426	4·7	2·5	65·3	524·9	5·50	1·00	6·50	10·00	8·00	...	...	7·1	5·1	19	3·93	2·34
54·2	·420	4·6	2·2	68·1	524·3	4·50	2·50	4·50	12·50	5·00	...	...	7·2	5·5	18	4·29	3·08
52·1	·390	4·3	2·2	66·5	527·2	9·50	1·00	5·00	11·50	4·00	...	...	7·4	5·0	18	5·98	4·80
56·2	·453	5·0	2·5	65·6	524·1	11·50	3·00	5·00	9·50	1·00	...	...	6·7	5·9	13	6·40	5·31
64·1	·599	6·5	3·1	67·0	515·8	4·00	2·00	11·00	10·00	4·00	...	...	6·5	5·6	8	1·20	0·85
70·9	·756	8·1	2·9	73·0	510·5	5·00	1·50	9·00	10·50	4·00	...	...	7·7	5·4	13	5·65	4·64
72·7	·803	8·6	3·8	68·8	507·0	3·50	2·00	6·50	11·00	8·00	...	...	6·9	4·4	18	9·54	8·25
73·5	·829	8·7	4·3	67·4	504·7	4·00	4·50	12·50	9·00	1·00	...	...	6·1	5·1	19	6·94	6·10
67·9	·683	7·3	4·0	64·8	508·8	5·50	10·50	5·50	3·50	5·00	...	...	6·1	5·1	10	4·89	4·49
65·0	·619	6·7	3·3	66·6	512·0	10·00	7·50	6·00	6·50	1·00	...	...	6·6	5·0	14	6·19	5·26
62·8	·574	6·2	2·3	73·0	519·1	6·50	5·00	8·00	9·50	1·00	...	...	7·5	6·3	14	4·10	3·33
57·6	·476	5·2	2·2	70·5	526·0	7·00	7·00	6·00	6·00	5·00	...	...	7·8	5·3	13	7·79	6·83
62·6	·585	6·3	2·9	68·0	517·0	76·50	47·50	85·50	109·50	47·00	...	...	6·9	5·3	177	66·90	55·28

Appendix

Abstract of Results of Meteorological Observations

Stations, with their Height above the Sea.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
							Mean						Hygrometer.	
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Year.	Lowest during Year.	Range during Year.	Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.	Maximum in Sun's rays.	Minimum on Grass.	Dry Bulb.	Wet Bulb.
Halifax, N.S. ... 125 ft.	29·709	30·405	28·745	93·0	0·0	93·0	53·6	32·2	21·4	42·9	95·0	29·5	45·7	42·3
Barbadoes ... ... 25 „	29·982	30·141	29·754	93·2	67·5	25·7	87·3	74·0	13·3	80·6	142·3	70·3	83·3	74·7
Newcastle, Jamaica ... 3,800 „	...	...	...	99·0	50·0	49·0	80·8	62·6	18·2	71·7	136·7	...	70·6	66·2
Up Park Camp, Jamaica ... 225 „	...	...	...	105·0	51·0	54·0	95·8	65·3	30·5	80·5	141·7	62·6	85·0	74·9
Nassau, Bahamas 44 „	29·980	30·220	29·690	*99·0	*57·0	*42·0	*87·9	*65·7	22·1*	*76·6	*141·9	*47·7	79·3	74·2
Bermuda ... ... 61 „	29·899	30·322	29·321	94·2	39·0	55·2	78·3	63·1	15·2	70·3	132·7	54·1	73·3	67·9

Abstract of Results *of Meteorological* Observations

Colombo, Ceylon. Lat. 6° 56′ N.

Month.														
January	29·880	29·939	29·816	94·2	63·7	30·5	90·3	68·7	21·6	79·5	...	...	82·2	77·9
February	29·884	29·943	29·808	94·6	65·4	29·2	91·8	70·1	21·7	80·9	...	...	83·8	78·3
March	29·891	29·963	29·822	96·4	66·3	30·1	93·6	70·5	23·1	82·0	...	...	85·5	79·8
April	29·859	29·946	29·749	101·4	67·4	34·0	98·3	71·9	26·4	85·1	...	...	85·2	80·3
May	29·842	29·896	29·765	97·4	65·4	32·0	93·7	71·3	22·4	82·5	...	...	84·6	80·0
June	29·816	29·888	29·704	95·4	65·4	30·0	92·7	70·6	22·1	81·6	...	...	84·7	79·5
July†	29·850	29·920	29·799	92·7	65·4	27·3	90·2	69·5	20·7	79·8	141·0	68·5	82·7	78·9
August	29·833	29·895	29·768	93·3	68·4	29·9	91·1	72·1	22·0	83·1	144·9	71·5	85·1	79·9
September	29·837	29·916	29·751	93·6	63·2	30·4	89·7	67·1	22·6	78·4	130·6	66·4	83·5	79·2
October‡	29·877	29·958	29·805	94·8	68·3	26·5	92·6	70·5	22·1	81·5	143·1	70·0	85·0	79·9
November	29·841	29·908	29·758	92·4	64·8	27·6	90·0	69·6	20·4	79·8	133·2	68·9	82·9	78·2
December	29·881	29·973	29·801	91·6	70·3	21·3	89·3	71·5	17·8	80·4	141·9	69·5	82·7	79·0
Sums, Means, and Totals...	29·858	29·929	29·779	95·2	66·2	29·0	92·2	70·3	21·9	81·2	...	...	84·0	79·2

Kandi, Ceylon. Lat. 7° 18′ N.

January	...	...	...	95·4	54·2	41·2	88·7	61·9	26·8	75·3	...	...	78·4	71·3
February	...	...	...	98·2	51·2	44·0	92·6	60·7	31·9	76·6	...	...	81·5	71·1
March	...	...	...	102·8	55·4	47·4	96·7	62·6	34·1	80·6	...	...	86·6	73·1
April	...	...	...	105·4	60·4	45·0	94·1	65·0	29·1	79·5	...	...	82·6	74·7
May	...	...	...	97·0	60·0	37·0	91·8	64·7	27·1	78·2	...	...		
June	...	...	...	96·0	61·0	35·0	90·8	67·0	23·8	78·9	...	...		
July	...	...	...	96·9	64·0	32·9	93·0	65·5	27·5	79·2	...	...		
August	...	...	...	93·0	60·0	33·0	90·2	64·8	25·4	77·5	...	...	No Wet	
September	...	...	...	96·0	61·5	34·5	87·6	65·1	22·5	76·3	...	...		
October	...	...	...	92·0	62·0	30·0	90·2	66·4	23·8	78·3	...	...		
November	...	...	...	93·0	61·0	32·0	89·6	63·7	25·9	76·6	...	...		
December	...	...	...	92·0	60·0	32·0	89·1	62·6	26·5	75·8	...	...		
Yearly Sums, Means, and Totals	...	...	...	96·4	59·5	36·9	91·4	64·2	27·2	77·8	...	...	§	§

* For 9 Months only. † July—Observations extend over 24 days only.
‡ Observations extend over 19 days only. § Useless to summarize.

No. XVII—*continued.*

taken at Stations in North America and the West Indies, in the Year 1872.

Hygrometrical Results from Glaisher's Tables (edition).						Atmospherical Conditions.													
Mean Temperature of Dew Point.	Mean elastic Force of Vapour. In a Cubic Foot of Air.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	Number of Days for mean Direction of Wind. North.	East.	South.	West.	Number of calm, or nearly calm, Days.	Calculated from Robinson's Anemometer. Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	Amount of Rain fall. On the Ground.	Feet above the the Ground.	Latitude.	Longitude.
											lbs. per sq. foot	Miles				Inches	Inches	° ′	° ′
36·1	·260	2·9	1·1	69·3	544·2	151·50	24·00	75·50	113·00	2·00	...	251·2	6·8	3·3	153	53·25	...	40 49 N.	60 36 W.
69·0	·711	7·6	4·6	62·1	508·6	125·00	207·25	32·25	0·00	1·50	...	213·1	5·1	5·3	209	48·69	...	13 4 „	59 40 „
62·0	·573	6·2	1·9	76·7	...	53·25	98·50	0·00	2·25	212·00	...	...	1·8	5·3	145	66·32	...	18 62 „	76 42 „
68·2	·692	7·3	5·5	57·2	...	32·00	129·50	102·50	10·50	0·50	...	100·3	4·3	4·1	55	19·27	...	17 59 „	76 56 „
70·6	·762	8·2	2·7	74·7	511·9	108·50	150·00	79·50	28·00	0·00	...	...	5·2	4·4	83	63·98	...	25 5 „	77 21 „
62·6	·585	6·3	2·9	68·0	522·0	76·50	47·50	85·50	109·50	47·00	...	...	6·9	5·3	177	66·90	...	32 17 „	64·47 „

taken at Stations in the Island of Ceylon, in the Year 1872.

Long. 79° 49′ E. Height above Sea 18 feet.

75·0	·868	9·3	2·5	78·8	506·9	18·75	11·75	0·00	0·50	0·00	...	107·4	4·1	5·8	6	1·64	1·31	...	...
74·7	·857	9·1	3·2	74·0	505·5	18·00	8·50	0·00	2·50	0·00	...	95·4	3·9	5·8	6	1·48	1·22	...	...
76·1	·903	9·5	3·5	73·2	503·8	5·75	0·00	9·50	14·25	1·50	...	78·2	3·4	5·7	10	4·87	4·15	...	...
77·1	·934	9·8	3·0	76·4	503·3	0·00	0·00	17·50	12·50	0·00	...	108·3	5·9	5·8	25	15·57	13·78	...	...
77·0	·928	9·9	2·8	77·6	503·6	1·00	0·00	16·75	16·75	0·50	...	114·1	5·0	5·6	20	3·41	2·53	...	...
76·1	·902	9·6	3·1	75·2	503·4	0·00	0·00	12·50	17·50	0·00	...	106·2	5·3	5·6	14	3·51	2·99	...	...
76·4	·906	9·6	2·3	81·7	505·7	1·50	0·00	4·75	17·75	0·00	...	*	4·6	5·4	6	0·39	0·24	...	...
76·5	·915	9·6	3·2	75·2	503·1	0·75	0·00	18·25	12·00	0·60	...	114·0	5·0	5·3	10	3·97	2·50	...	...
76·3	·906	9·7	2·5	79·0	504·7	1·25	0·25	43·50	15·00	0·00	...	200·1	6·7	6·2	22	17·03	15·84	...	...
76·5	·917	9·6	3·1	75·6	503·9	2·00	0·00	5·75	11·25	0·00	...	132·0	6·5	6·0	15	5·72	4·98	...	...
75·1	·868	9·2	2·7	77·4	505·0	19·50	9·25	0·00	1·25	0·00	...	126·5	6·0	5·8	19	8·20	7·18	...	...
76·6	·911	9·7	2·2	81·5	506·2	21·00	8·50	0·00	1·50	0·00	...	114·9	4·1	5·5	8	0·57	0·43	...	...
76·1	·901	9·5	2·8	77·1	504·6	89·50	38·25	94·50	122·75	2·00	...	118·0	5·0	5·7	156	66·36	57·23	...	...
						347 days only.													

Long. 80° 48′ E. Height above Sea 1,678 feet.

66·4	·648	6·9	3·5	67·0	...	0·75	14·75	14·75	0·75	9·00	...	...	5·3	6·2	8	1·11	...	...	...
64·1	·593	6·4	5·1	54·9	...	1·25	13·25	13·50	1·00	0·00	...	...	3·7	5·5	6	6·72	...	...	...
64·4	·605	6·3	9·1	48·1	...	4·00	8·25	10·00	5·75	3·00	...	...	3·3	3·7	4	1·19	...	...	...
69·4	·719	7·7	4·2	65·0	...	7·50	5·50	4·00	6·00	7·00	...	...	5·9	5·8	22	12·46	...	...	...
					...	6·50	8·25	7·00	9·25	0·00	...	...	2·0	3·0	4	1·30	...	...	...
					...	1·00	9·00	6·50	12·50	0·50	...	...	5·3	5·5	18	22·98	...	...	...
					...	0·75	5·00	14·75	10·50	0·00	...	...	3·9	4·9	9	3·23	...	...	...
Bulb readings.					...	9·00	11·75	6·50	3·75	0·00	...	...	3·9	4·8	12	2·87	...	...	...
					...	15·00	9·75	0·00	5·25	0·00	...	...	5·4	5·0	15	15·43	...	...	...
					...	14·00	10·50	1·50	5·00	0·00	...	...	4·7	5·0	17	10·56	...	...	...
					...	11·25	14·25	3·75	0·75	0·00	...	...	3·2	5·9	21	15·09	...	...	...
					...	8·50	15·50	7·00	0·00	0·00	...	...	3·0	5·1	14	6·48	...	...	...
†	†	†	†	†	...	80·00	125·75	89·25	60·50	10·50	...	...	4·1	4·9	150	99·42	...	...	...

* Out of order. † Useless to summarize.

Appendix

TRINCOMALEE, CEYLON. Lat. 8° 30′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Mean				Maximum in Sun's rays.	Minimum on Grass.	Hygrometer.	
							Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.			Dry Bulb.	Wet Bulb.
January	...	...	...	92·0	64·0	28·0	88·4	70·7	17·7	79·5	...	...	81·2	75·7
February	...	...	...	92·0	64·0	28·0	90·5	70·1	20·4	80·3	...	...	82·5	76·0
March	...	...	...	96·0	65·0	31·0	93·2	70·0	23·2	81·6	...	...	85·4	79·2
April	...	...	...	100·4	65·4	35·0	94·7	71·8	22·9	83·2	...	...	87·4	79·8
May	...	...	...	104·2	63·6	40·6	99·8	75·1	24·7	87·4	...	...	80·7	81·9
June	...	...	...	103·0	73·0	30·0	99·0	74·0	25·0	86·5	...	...	87·9	79·9
July	...	...	...	102·2	70·2	32·0	100·0*	73·3*	26·7*	86·6*	...	...	87·8	79·5
August	...	...	...	101·4	Minimum in air thermometer broken.						...	...	86·9	79·8
September	...	...	...	100·0							...	...	85·7	79·0
October...	...	...	...	99·0							...	...	85·4	79·6
November	...	...	...	93·0	62·0	31·0	89·6†	68·4†	21·2†	79·0†	...	...	83·5	79·9
December	...	...	...	91·4	66·4	25·0	90·0	69·5	20·5	79·7	...	...	83·7	79·7
Yearly Sums, Means, and Totals ...	...	...	...	‡	‡	‡	‡	‡	‡	‡	...	...	84·8	79·2

Abstract of Results of Meteorological Observations

Stations, with their Height above the Sea.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Year.	Lowest during Year.	Range during Year.	Mean				Maximum in Sun's rays.	Minimum on Grass.	Hygrometer.	
							Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.			Dry Bulb.	Wet Bulb.
Colombo§ ... 18 ft.	29·858	29·973	29·704	101·4	63·2	38·2	92·2	70·3	21·9	81·2	69·5‖	34·6‖	84·0	79·2
Kandi ... 1,678 „	...	...	...	102·8	54·2	48·6	91·4	64·2	27·2	77·8	¶	¶	¶	¶
Trincomalee 25 „	...	...	...	‡	‡	‡	‡	‡	‡	‡	‡	‡	84·8	79·2

* For 17 days only. † For 16 days only. ‡ Useless to summarize.
§ July observations for 24 days only; October for 19 days only. ‖ For 6 months only.
¶ Useless to summarize. No wet bulb readings for 8 months.

No. XVII—*continued.*

Long. 82° 0′ E. Height above the Sea 25 feet.

Hygrometrical Results from Glashier's Tables (3rd edition).						Atmospherical Conditions.											
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	In a Cubic Foot of Air.			Mean Weight of Cubic Foot of Air.	Number of Days for mean Direction of Wind.				Number of calm, or nearly calm, Days.	Calculated from Robinson's Anemometer.		Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of days on which Rain fell.	Amount of Rain fall.	
		Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean degree of Humidity.		North.	East.	South.	West.		Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.				On the Ground.	18 Feet above the Ground.
											lbs. per sq. foot	Miles				Inches	Inches
72·0	·785	8·4	3·0	74·0	...	14·50	14·50	2·00	0·00	0·00	...	...	4·0	4·7	13	4·17	...
71·7	·775	8·3	3·5	70·0	...	14·50	14·50	0·00	0·00	0·00	...	...	3·4	4·7	7	1·2	...
75·2	·876	9·2	3·7	71·2	...	15·50	15·50	0·00	0·00	0·00	...	...	0·9	5·0	1	0·0	...
74·9	·867	9·1	4·6	66·6	...	14·00	14·00	1·00	1·00	0·00	...	...	2·6	4·7	7	2·9	...
76·4	·913	9·5	6·1	62·6	...	0·00	0·00	15·50	15·50	0·00	...	...	1·4	2.4	1	1·55	...
74·8	·863	9·1	4·9	65·0	...	0·00	0·00	15·00	15·00	0·00	...	...	3·5	1·2	1	0·10	...
74·2	·846	8·9	5·0	63·8	...	0·00	0·00	15·50	15·50	0·00	...	...	1·8	1·9	5	2·00	...
75·2	·878	9·2	4·3	68·5	...	0·00	0·00	15·50	15·50	0·00	...	...	2·0	2·9	12	3·97	...
74·7	·860	9·1	4·0	69·2	...	0·00	0·00	15·00	15·00	0·00	...	...	2·6	3·7	8	3·13	...
75·8	·895	9·4	3·5	72·8	...	0·00	4·00	13·50	13·50	0·00	...	...	3·2	3·1	14	7·97	...
77·5	·942	10·0	2·1	82·5	...	14·00	14·00	0·00	2·00	0·00	...	...	4·2	4·9	27	20·32	...
77·1	·928	9·9	2·4	80·7	...	15·50	15·50	0·00	0·00	0·00	...	...	3·6	4·5	17	10·38	...
74·6	·869	9·2	3·9	70·6	...	88·00	92·00	93·00	93·00	0·00	...	...	2·8	3·6	113	57·76	...

taken at Stations in the Island of Ceylon, in the Year 1872.

Hygrometrical Results from Glaisher's Tables (edition).						Atmospherical Conditions.												
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	In a Cubic Foot of Air.			Mean Weight of Cubic Foot of Air.	Number of Days for mean Direction of Wind.				Number of Calm, or nearly calm, Days.	Calculated from Robinson's Anemometer.		Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	Rain fall on the Ground.	Latitude.	Longitude.
		Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.		North.	East.	South.	West.		Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.						
											lbs. per sq. foot	Miles				Inches	° ′	° ′
76·1	·901	9·5	2·8	77·1	504·6	89·50*	38·25*	94·50*	122·75*	2·00*	...	118·0	5·0	5·7	156	66·36	6 56 N.	79 49 E
†	†	†	†	†	†	80·00	125·75	89·25*	60·50	10·50	...	...	4·1	4·9	150	99·42	7 18 „	80 48 „
74·6	·869	9·2	3·9	70·6	...	88·00	92·00	93·00	93·00	0·00	...	...	2·8	3·6	113	57·76	8 30 „	82 30 „

* For 347 days only.

† Useless to summarize. No wet bulb readings for 8 months.

Appendix

Abstract of Results of Meteorological Observations

GIBRALTAR. Lat. 36° 6′ N.

Month.	Readings of the Barometer.			Temperature of the Air.			Mean				Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.	Maximum in Sun's rays.	Minimum on Grass.	Hygrometer. Dry Bulb.	Hygrometer. Wet Bulb.
January	30·087	30·372	29·584	66·0	44·0	22·0	60·1	50·3	9·8	55·2	78·6	32·2	55·8	52·7
February ...	30·080	30·238	29·778	80·5	45·5	35·0	62·8	51·3	11·5	57·0	83·7	35·1	57·0	54·5
March	29·903	30·229	29·470	72·0	45·8	26·2	64·2	52·8	11·4	58·5	98·4	36·4	58·8	54·6
April	29·944	30·221	29·560	87·0	50·0	37·0	68·9	54·1	14·8	61·5	99·9	39·2	62·0	56·8
May	29·936	30·196	29·692	85·0	51·0	34·0	76·0	56·5	19·5	66·2	110·4	43·0	66·5	59·5
June	29·980	30·167	29·845	90·6	55·6	35·0	83·0	63·0	20·0	73·0	115·1	50·3	73·5	65·6
July	29·923	30·050	29·813	94·0	62·0	32·0	87·3	67·2	20·1	77·2	119·7	60·0	78·0	71·5
August	29·962	30·077	29·828	91·2	61·6	30·2	85·7	66·4	19·3	76·0	114·5	50·5	76·4	72·0
September ...	29·954	30·219	29·714	87·0	59·4	27·6	79·0	66·5	12·5	72·7	101·6	*	73·9	68·4
October... ...	29·956	30·242	29·550	77·0	49·4	27·6	68·6	55·8	12·8	62·2	102·0	52·4	63·6	58·5
November ...	30·061	30·281	29·743	72·0	43·0	29·0	64·3	33·1	11·2	58·7	90·2	50·9	60·2	56·2
December ...	29·978	30·281	29·290	64·0	42·6	21·4	59·7	47·7	12·0	53·7	81·9	44·9	54·5	50·4
Yearly Sums, Means, and Totals ...	29·980	30·214	29·656	80·5	50·8	29·7	71·6	57·0	14·6	64·3	99·7	45·0	65·0	60·1

MALTA. Lat. 35° 53′ N.

January	29·788	30·169	29.414	65·0	45·0	20·0	60·0	51·4	8·6	55·7	114·8	†	57·2	52·4
February ...	29·974	30·224	29·551	67·0	48·0	19·0	61·8	50·4	8·4	57·6	119·9	49·8	59·4	54·4
March	29·776	30·130	29·515	70·2	50·0	20·2	63·6	54·6	9·0	59·1	117·8	52·1	61·0	56·1
April	29·736	29·926	29·442	76·8	50·0	26·8	67·5	56·9	10·6	62·2	123·5	54·9	64·7	58·0
May	29·852	30·038	29·632	‡	‡	‡	‡	‡	‡	‡	126·6	60·5	69·1	62·7
June	29·868	30·036	29·709	87·6	60·0	27·6	77·8	66·1	11·7	71·9	131·3	†	64·4	67·1
July	29·828	29·932	29·690	93·2	68·0	25·2	84·7	72·7	12·0	78·7	137·9	†	80·4	71·8
August	29·821	29·931	29·706	92·2	70·2	22·0	86·1	73·8	12·3	79·9	138·6	†	81·4	73·1
September ...	29·879	30·105	29·678	89·0	68·2	20·8	82·4	72·8	9·6	77·6	137·6	67·5	79·8	72·6
October... ...	29·785	30·021	29·579	82·2	63·2	19·0	77·3	69·1	8·2	73·2	131·1	63·8	75·2	68·7
November ...	29·903	30·164	29·508	73·8	55·4	18·4	69·2	61·1	8·1	65·1	125·3	55·6	66·9	61·2
December ...	29·846	30·276	29·288	73·0	54·0	19·0	65·4	57·8	7·6	61·1	114·6	51·8	63·0	57·0
Yearly Sums, Means, and Totals ...	29 838	30·080	29·550	79·1	57·5	21·6	72·3	62·7	9·6	67·5	126·6	...	69·4	63·0

SCUTARI. Lat. 41° 0′ N.

January	29·980	30·307	29·513	65·0	31·0	34·0	51·4	40·4	11·0	45·9	75·7	33·3	46·3	43·5
February ...	30·131	30·226	29·333	57·8	28·4	29·4	47·0	35·7	11·3	41·3	80·5	29·1	41·9	39·3
March§... ...	29·957	30·537	29·434	73·0	30·4	42·6	56·9	40·1	16·8	48·5	100·6	33·8	50·9	46·5
April‖	29·804	30·062	29·556	82·4	39·8	42·6	67·2	47·8	19·4	57·5	112·0	40·3	61·0	55·7
May	29·862	30·126	29·556	86·8	42·4	47·4	77·6	54·5	23·1	66·1	127·3	47·1	70·3	63·2
June ¶	29·829	30·014	29·609	90·6	52·4	38·2	81·2	59·1	22·1	70·0	126·1	52·0	73·6	65·5
July ¶	29·785	29·933	29·622	93·6	58·0	35·6	86·5	63·0	23·5	74·7	133·6	56·0	79·5	70·1
August§	29·767	29·911	29·600	94·4	57·4	37·0	83·8	64·0	19·8	73·9	126·5	57·4	77·5	70·0
September ...	29·903	30·159	29·659	94·6	55·2	39·4	81·8	60·3	21·5	71·0	126·6	52·2	75·0	67·6
October§	29·993	30·162	29·831	86·4	49·6	36·8	76·9	55·2	21·7	66·0	119·2	47·6	69·4	62·6
November‖ ...	29·994	30·300	29·761	77·8	45·8	32·0	66·8	52·4	14·4	59·6	94·2	45·2	62·1	58·2
December‖ ...	30·033	30·464	29·329	67·6	34·4	33·2	58·0	45·3	12·7	51·6	81·9	37·9	53·6	49·8
Yearly Sums, Means, and Totals ...	29·920	30·192	29·585	81·1	43·7	37·4	69·6	51·5	18·1	60·5	108·7	44·4	63·4	57·7

Stations.													
Gibraltar ... 50 feet	29·980	30·372	29·290	94·0	42·6	51·4	71·6	57·0	14·6	64·3	99·7	45·0	65·0	60·1
Malta ... 111 „	29·838	30·224	29·288	93·2	45·0	48·2	72·3	62·7	9·6	67·5	126·6	**	69·4	63·0
Scutari ... 60 „	29·920	30·537	29·333	94·6	28·4	66·2	69·6	51·5	18·1	60·5	108·7	44·4	63·4	57·7

* Broken. † Out of order. ‡ Maximum in Air Thermometer broken.
§ Barometer and Hygrometer for 30 days only. ‖ Barometer and Hygrometer for 29 days only.
¶ Barometer and Hydrometer for 27 days only. ** Useless to summarize.

No. XVII—*continued.*

taken at Stations in the Mediterranean, in the Year 1872.

Long. 5° 20′ W. Height above Sea 50 feet.

Hygrometrical Results from Glaisher's Tables (edition).						Atmospherical Conditions.												
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	In a Cubic Foot of Air.		Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	Number of Days for mean Direction of Wind.				Number of calm, or nearly calm, Days.	Calculated from Robinson's Anemometer.		Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	Amount of Rain fall.		Latitude.	Longitude.
		Mean Weight of Vapour.	Mean additional Weight required for Saturation.			North.	East.	South.	West.		Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.				On the Ground.	25 Feet above the Ground.		
											lbs. per sq. foot	Miles				Inches	Inches	° ′	° ′
49·8	·360	4·0	0·9	81·2	539·8	13·75	1·50	1·75	14·00	0·00	...	820·5	5·8	5·6	11	3·18	2·33	...	...
52·2	·391	4·3	0·8	84·0	537·3	6·00	10·75	4·75	7·50	0·00	...	541·5	5·4	5·6	16	4·55	4·28	...	...
50·8	·372	4·2	1·4	75·0	533·3	5·75	11·00	4·00	10·25	0·00	...	825·0	5·3	5·0	7	3·51	3·45	...	...
52·3	·394	4·3	1·9	71·0	530·6	4·75	9·00	4·00	12·25	0·00	...	837·5	5·2	4·8	5	2·17	2·01	...	...
53·8	·415	4·6	2·5	64·0	526·8	4·25	11·75	1·00	14·00	0·00	...	632·6	3·4	4·6	4	1·01	0·89	...	...
59·8	·516	5·6	3·4	62·9	519·1	1·75	15·25	0·50	12·50	0·00	...	741·0	2·7	4·1	1	0·17	0·09	...	...
66·9	·661	7·1	3·2	69·0	512·8	1·25	12·00	0·00	17·75	0·00	...	745·8	1·5	4·2	0	0·00	0·00	...	...
68·9	·607	7·6	2·2	77·4	514·7	1·50	19·25	0·25	10·00	0·00	...	728·8	3·0	4·4	0	0·00	0·00	...	...
64·3	·605	6·6	2·5	72·4	517·7	4·25	15·75	1·25	8·75	0·00	...	644·4	5·0	4·1	5	7·50	7·33	...	...
54·2	·422	4·7	1·8	72·1	529·0	8·50*	3·00*	0·00*	15·50*	0·00*	...	649·0	4·9	5·3	10	5·62	5·28	...	...
52·7	·398	4·4	1·4	76·2	534·6	5·50†	5·25†	0·00†	6·75†	0·00†	...	511·0	5·7	5·6	5	2·26	2·17	...	...
46·4	·315	3·6	1·2	73·9	539·6	14·75	4·25	1·25	10·75	0·00	...	701·3	4·9	5·6	12	6·18	5·70	...	...
56·0	·445	5·1	1·9	73·2	529·6	72·00	118·75	18·75	140·00	0·00	...	691·1	4·4	4·9	76	36·15	33·53	...	...

Long. 14° 30′ E. Height above Sea 111 feet.

48·0	·335	3·8	1·5	71·2	533·1	8·50	4·25	4·75	10·50	2·00	...	112·6	5·0	4·3	15	3·29	3·33	...	...
49·9	·360	4·0	1·6	71·0	534·1	5·50	9·50	6·25	5·25	2·50	...	103·9	6·5	5·1	9	2·34	2·38	...	...
51·9	·386	4·3	1·7	72·5	528·7	8·50	7·75	4·00	10·25	0·50	...	158·4	7·0	5·5	7	0·18	0·20	...	...
52·4	·395	4·4	2·4	64·2	524·8	8·00	7·25	4·25	9·00	1·50	...	133·7	3·5	6·5	8	0·79	0·82	...	...
57·6	·476	5·2	2·6	66·4	521·4	6·75	7·75	2·50	6·00	8·00	...	57·9	4·0	5·0	2			...	...
61·8	·552	6·0	3·3	64·8	516·6	10·75	10·00	3·00	4·75	1·50	...	52·6	3·0	4·5	2	§	§	...	...
65·9	·638	6·9	4·3	61·0	509·0	14·50	7·25	1·75	7·50	0·00	...	61·8	2·5	3·5	1			...	...
67·5	·673	7·2	4·3	63·2	507·8	14·25	5·50	1·50	8·75	1·00	...	63·9	2·0	4·0	1	0·10	1·10	...	...
67·7	·678	7·3	3·6	66·2	510·2	9·75	10·25	3·50	5·00	1·50	...	75·2	3·5	4·5	0	0·00	0·00	...	...
64·0	·598	6·5	3·0	68·2	513·5	6·50	9·75	7·25	5·50	2·00	...	102·1	7·0	5·0	9	3·38	3·30	...	...
56·6	·460	5·1	2·2	70·4	524·5	12·75	8·25	1·50	6·50	1·00	...	94·2	5·0	4·0	2	1·72	1·71	...	...
51·9	·387	4·3	2·1	67·0	528·0	5·25	8·75	5·75	5·75	5·50	...	115·3	6·5	5·0	12	1·66	1·70	...	...
57·9	·495	5·4	2·7	67·2	521·0	111·00	96·25	46·00	84·75	28·00	...	94·3	4·5	4·7	68	13·46	13·54	...	...

Long. 29° 3′ E. Height above Sea 60 feet.

40·3	·251	2·9	0·7	80·6	548·8	8·50	9·50	8·50	1·50	3·00	...	198·3	7·3	6·0	12	1·48	1·23	...	...
36·1	·214	2·5	0·6	81·0	556·7	11·25	13·25	2·00	2·00	0·50	...	195·6	7·9	7·1	18	4·06	3·58	...	...
41·9	·266	3·1	1·1	72·5	543·8	10·00	8·50	6·75	3·25	2·00	...	159·2	5·7	5·6	7	0·62	0·56	...	...
51·1	·375	4·2	1·8	70·5	529·3	7·00	5·25	8·00	6·25	3·00	...	121·6	5·5	6·0	10	1·09	1·03	...	...
57·7	·478	5·2	2·9	64·6	520·3	7·00	7·00	9·75	7·25	0·00	...	128·0	3·1	5·8	4	1·26	1·09	...	...
59·5	·511	5·5	3·4	62·2	516·4	5·25	2·00	10·75	9·50	1·00	...	90·7	4·3	5·0	7	1·59	1·46	...	...
63·7	·589	6·3	4·5	57·9	509·5	12·00	9·50	3·50	4·00	0·00	...	109·4	2·7	4·9	5	1·57	1·51	...	...
64·7	·613	6·6	3·5	65·0	510·0	12·75	9·50	3·75	4·00	0·00	...	114·0	4·3	5·4	10	4·32	4·06	...	...
62·3	·562	6·0	3·4	64·4	516·0	8·75	8·50	4·75	6·50	1·50	...	95·8	3·0	5·3	5	1·00	0·99	...	...
57·3	·470	5·1	2·7	64·8	523·7	6·75	10·75	7·25	5·75	1·00	...	107·4	5·4	8·6	3	0·24	0·22	...	...
54·9	·431	4·8	1·4	77·5	531·1	7·00	8·50	6·50	5·00	2·00	...	136·4	5·5	5·7	10	2·40	2·20	...	...
46·1	·311	3·5	1·1	75·8	541·4	6·50	9·25	7·00	5·25	2·00	...	185·2	6·5	7·0	16	3·58	3·16	...	...
53·0	·423	4·6	2·3	69·8	528·0	102·75	101·50	78·50	59·25	16·00	...	136·8	5·1	5·9	107	23·21	21·00	...	...
						358 days only.													

56·0	·455	5·1	1·9	73·2	529·6	72·00	118·75	18·75	140·00	0·00	...	697·1	4·4	4·9	76	36·15	...	36 6 N.	5 26 W.
57·9	·495	5·4	2·7	67·2	521·0	111·00	96·25	46·00	84·75	28·00	...	94·3	4·5	4·7	68	13·46	...	30 53 „	14 30E.
53·0	·423	4·6	2·3	69·8	528·9	102·75	101·50	78·50	59·25	16·00	...	136·8	5·1	5·9	107	23·21	...	41 0 „	29 3 „

* October, 4 days short. † November, 13½ days short. ‡ 20 ft. above the ground. § Slight showers.
‖ Atmospherical conditions:—March, August, and October, 30 days; April, November, and December, 29 days; June and July, 27 days.

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Digitized with financial assistance from

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a project facilitated by the Rotary Club of Bombay

on 12 April, 2019